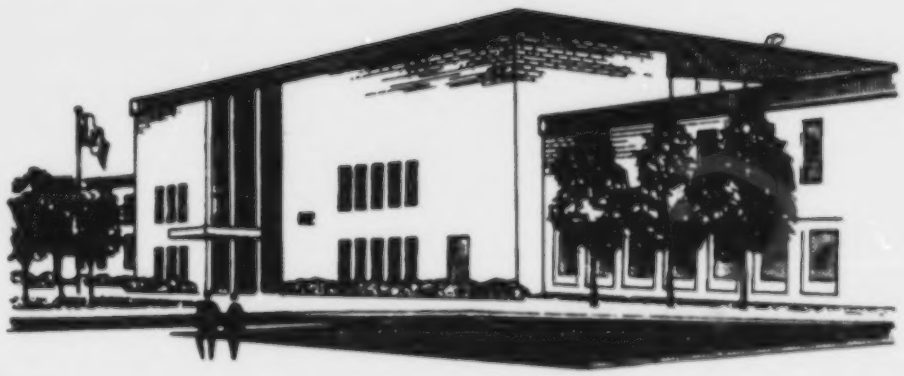
River Road Environmental Technology Centre



Annual Activity Report

April 1, 1988 to March 31, 1989

Environment Canada
Conservation and Protection
Technology Development and Technical Services

River Road Environmental Technology Centre

Annual Activity Report
April 1988 - March 1989

Conservation & Protection
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Introduction

The River Road Environmental Technology Centre (RRETC) is located in Gloucester, Ontario, close to the Ottawa International Airport. The RRETC is one of two technology centres operated by Conservation and Protection, Environment Canada, in support of the federal mission to protect the environment. RRETC deals primarily with technologies to measure air pollutants and to respond to spills of hazardous materials. The sister Wastewater Technology Centre in Burlington, Ontario, deals with technologies to control water pollution and residues. A significant proportion of the technology work is contracted to the private sector.

The activities of the RRETC are summarized on a yearly basis in the Annual Report series. Project results are documented in informal (unedited) reports, and a formal Environment Canada (edited) report series available in both official languages. In addition, staff contribute technical papers to proceedings of conferences and workshops. A summary of reports and papers from the Centre in 1988/89 is included in Appendix A.

Also, a listing of staff members is included in Appendix B.

Chemistry Division (CD)

The Division has a capability to analyze for a variety of organic and inorganic compounds in diverse sample matrices which usually originate from air pollution-related sources. Analytical method development work is also undertaken to ensure the most appropriate procedures are used for specific sample types.

The Organic Laboratory measures ultra trace (ppt, ppq) levels of many organic compounds with particular emphasis on the analysis of chlorinated dibenzo-p-dioxins (PCDD), chlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCB), polycyclic aromatic hydrocarbons (PAH) and priority pollutants. A specially designed and operated High Hazard laboratory is used for the analysis of these extremely toxic chemicals. The laboratory carries out major analytical projects in support of national programs like the National Incinerator Testing and Evaluation Program (NITEP); designs and implements interlaboratory studies to validate procedures; and manages QA/QC and method development programs to ensure data generated by contract labs, for ultra-trace levels (ppt, ppq) of these organic compounds in complex sample matrices are of the highest quality.

The Inorganic Laboratory measures a number of common anions associated with acid rain including sulphates, nitrates, fluoride, bromide and phosphates. Additionally, a multi-element analytical capability exists for toxic metals such as arsenic, lead and mercury.

A Quality Assurance/Quality Control (QA/QC) Section undertakes QA/QC activities in support of activities of the Federal Provincial Advisory Committee on Air Quality (FPACAQ).

CD Highlights

1. The NITEP/USEPA RDF project experienced considerable difficulties in getting the field work started because of major problems with boilers and other incinerator components. As a result, field samples only began arriving in the lab late in this FY. About 90 analyses have been completed on proofing, leachates and stack samples. Ashes and refuse samples will not arrive until June/July '89 because of problems in processing these at the contract lab. As a result, our lab work will be carried out over a protracted period of time into next FY.

   We have analyzed six USEPA audit samples for PCDD/PCDF as an external QA check of our lab procedures. EPA's report on our performance concluded "All values reported except those for 2378 TCDD were within the acceptable limits established for these audit samples. The overall precision of the sample extraction and analysis was very good, and well within the ±50 QC criterion for duplicate analyses....." EPA originally were skeptical of our capabilities as we were limited to only low res MS at the time. Additional blind audit samples will be submitted throughout the analytical project.

2. After completion of the first interlab study for the measurement of dioxins in pulp and paper matrices in mid-April, a second interlab study was conducted and completed within two months. The variation of dioxin results among participating laboratories for studies I and II were compared. The performances of each laboratory with respect to different sample matrices were evaluated. A paper describing the work was presented at the Dioxin 88 conference in Sweden in August 1988.

3. Provided emergency analyses over a period of about one month in support of the St. Basile-le-Grand Warehouse fire. Staff worked long hours (12-20 hours/day) during the first two weeks while residents were out of their homes. Eventually we analyzed 90 samples in our lab including soils, surface wipe swabs, ambient air, water, soot, commercial intake filters. We also co-ordinated analyses of an additional 110 samples through six contract and two other government labs across Canada comprising soils, wipes and ambient air matrices.

4. We are collaborating with Whiteshell Nuclear Research facility, Pinawa, Manitoba, who are developing a trace organics analytical laboratory. They are analyzing the standards and samples from the pulp and paper studies using our mandated protocols to determine their capabilities for PCDD/PCDF analyses. They require this expertise to support their plans to develop technologies for destruction of toxic wastes - building on their expertise in radioactive waste disposal.

5. Mr. C. Chiu of our laboratory is represented on the Dioxin Quality Assurance Committee (DQAC) chaired by A. Chau, NWRI. This committee is over-seeing the implementation of analysis for the National Pulp Mill Sampling program to assure that data generated by the private contract labs doing the analyses are of the highest quality.

6. Completed a report on PCDD/PCDF and PCP analyses on the Prince George PCP Test Burn. Over 90 samples were analyzed - no dioxin/furan and only trace levels of PCBwere detected. We encountered problems with PCP spike recoveries and completed method develop-ment studies to resolve the problem.

7. Analysis of ambient air samples from Windsor/Walpole (Ontario Region) for PCDD/PCDF, PCB, PAH, CB, CP, multi-element, common anions continues.

8. Continue involvement in development of a standard reference method for PCDD/PCDF in ambient air in conjunction with Ontario MOE under Canadian Council of Minister of Environment (CCME). Field testing to obtain real-world samples for a government/contract lab round-robin will begin early spring 1989.

9. Installation of the new Hi Resolution Mass Spectrometer system (VG705) began on October 17, 1988 with the arrival of the VG engineer from Manchester. The MS facility had been previously fitted with the necessary electricity, chilled water and air conditioning. These preparations simplified the assembly and checkout of the various MS components and systems. Commissioning proceeded during the remainder of October exceeding all specifications including the 10,000 resolution, 100 fg @ s/n 10.1 for 2378 tetrachlorodioxin. Linear regression calibration curves and preliminary routines for plotting dioxin/furan congenor groups have been programmed and tested on standard mixtures using EPA audit samples as checks. Automatic peak detection using isotope ratios and relative retention time windows should provide marked improvements in objective quantitation procedures, which, when coupled with robotic injections and back-ground/foreground processing, should dramatically improve definitive quantitation and the volume of dioxin analyses at RRETC.

Environmental Emergencies Technology Division (EETD)

The EETD is a national focal point and the Department's centre for technical expertise on the properties, behaviour, effects and remedial measures for spills of hazardous materials. The Division manages the Arctic and Marine Oilspill Program (AMOP) to develop and demonstrate countermeasures for cold-climate oil spills. Program updates are provided at the international annual AMOP seminar.

The Chemical Hazards Emergency Countermeasures (CHEC) Program addresses needs for technical information packages for operational personnel, hazard-level monitoring at spill scenes, and the technology for chemical spill cleanup and prevention. Program updates are provided at the annual Technical Seminar on Chemical Spills.

In addition to seminar proceedings and project reports, the Division publishes a quarterly Spill Technology Newsletter (STNL).

EETD Highlights

1. In response to a request for assistance from EP Quebec, M. Fingas and A. Bobra were on-scene at St. Basile-le-Grand with the prototype field analytical system within 9 hours of the fire in the PCB storage facility. Sampling assistance was provided to the province and hundreds of samples were screened on site for PCB.

2. The 11th AMOP seminar was convened in Vancouver June 7-9 and there were 127 registered attendees, 37 more than there were last year.

3. The US Minerals Management Service contributed a total of $240,000 (US) towards seven joint projects with EETD.

4. At General Motors request, prototype mobile reverse osmosis and microfiltration/ultrafiltration units were deployed to their Oshawa plant for a 5-day evaluation on wastewater containing oil and glycol. Costs were reimbursed by GM and it was confirmed that the amount of wastewater transported to the disposal facility could be reduced by at least 90%.

5. A Solarchem prototype UV unit and mobile reverse osmosis equipment were deployed to Oswego NY at the U.S. EPA's expense for evaluation during a landfill cleanup. Organic contaminant concentrations ranging from 0.8 to 50 ppm were reduced to less than 10 ppb.

6. M. Fingas and K. Meikle were keynote speakers at a workshop convened by the U.S. Minerals Management Service (MMS) in Anchorage to determine research needs for arctic offshore oil spill response.

7. H. Whittaker was an invited speaker at the U.S. EPA's National Technology Seminar in Panama City, Fla. 15-17 November and summarized RRETC's membrane technology development activities.

8. A multi-year project was begun to prepare and implement Environment Canada recommended methods for aquatic toxicity testing of effluents, chemicals, elutriates, leachates and receiving waters. The first three were drafted and reviewed.

9. Aerial remote sensing services were provided and M. Fingas acompanied the Minister on his

trip to the west coast following the stranding of oil from the NESTUCCA barge accident.

10. M. Fingas advised Exxon and the U.S. National Oceanic & Atmospheric Administration on the properties and behaviour of Prudhoe Bay crude oil following the Exxon HOUSTON spill in Hawaii and the Exxon VALDEZ spill in Alaskan waters.

Pollution Measurement Division (PMD)

The PMD is responsible for co-ordination of the operations of the National Air Pollution Surveillance (NAPS) Network consisting of 380 air monitoring instruments at 130 sampling stations located in 52 major urban areas in Canada.

The Division also evaluates and develops new ambient air pollution measurement technology to support to NAPS network and priority issues such as LRTAP and Toxics.

Source monitoring activities include: development and update of Reference Methods for measurement of emissions from stationary industrial sources in support of CEPA Regulations and Guidelines; development of new emissions measurement methods in resonse to emerging priority issues; evaluation of commercially available monitors to measure stack emissions on a real-time basis; application of emissions measurement methods at source to satisfy the Department's need for information for a variety of purposes; and bench-scale research on incineration of hazardous wastes.

PMD Highlights

1. A technical seminar organized with the assistance of Alberta Environment was held in Edmonton, Alberta and attended by over thirty NAPS technicians and professionals.

2. The 11th Joint Canada/ U.S. Hazardous Wastes Incineration Research Workshop was held at River Road Environmental Technology Centre on February 6-7, 1989. Attending the workshop were technical experts representing Canada/ U.S. government agencies, industry and University sectors actively involved in hazardous wastes management and development of disposal technologies. Recommendations and decisions taken will influence the future direction of research activities in this field.

3. In support of the C&P Ontario Region monitoring program for the Detroit incinerator, two ambient air monitoring stations are being operated in the Windsor area. These sites are measuring dioxins, furans, polycyclic aromatic hydrocarbons, PCB, chlorophenols, chlorobenzenes, volatile organic compounds, inhalable particulates and metallic elements. A data report was prepared and forwarded to the Region for official release. A comparison study was conducted on monitoring methodology between Environment Canada and Roy F. Weston Ltd. (under contract to Detroit) by co-locating samplers in Detroit and in Windsor.

4. An intercomparison study of methodologies for ambient dioxin/furan measurement was carried out in Toronto in December. The study involved the Ontario Ministry of Environment and Environment Canada and

formed part of the Canadian Council of Minister of Environment (CCME)sponsored dioxin ambient method development effort. The results from the intercomparison study were presented at the APCA Toxics Symposium, held in Raleigh, N.C. in May 1988

5. In co-operation with IPB, the following Source Testing Reference Methods (RMs) are being developed or amended for incorporation into the appropriate CEPA regulations/guidelines:

   a) *"Measurement of Releases of Selected Semi-Volatile Organic Compounds from Stationary Sources"*, PMD, 1989 (New): for the Federal Mobile PCB Treatment and Destruction Regulations and as a general RM to measure dioxin, furan, PCB, and other SVOC emissions.

   b) *"Measurement of Releases of Gaseous Hydrogen Chloride from Stationary Sources"*, PMD, 1988 (new): for the Federal PCB Regulations and the CCME Municipal Waste Incinerator Operating Guidelines.

   c) *"Measurement of Releases of Particulates from Stationary Sources"*, PMD, 1974 (amended): as a general RM for emission sources regulated under CEPA.

   d) *"Measurement of Releases of Lead in Particulates from Stationary Sources"*, PMD, 1978 (amended): for the Secondary Lead Smelter Regulations and as a general RM.

   e) *"Measurement of Releases of Carbon Monoxide from Stationary Sources"*, PMD, 1989 (new): as a general RM for emission sources such as refineries and boilers.

   f) *"Measurement of Releases of Total Reduced Sulphur Compounds from Pulp and Paper Operations"*, PMD, 1989 (new): this RM was developed in co-operation with the industry.

6. The Industrial Programs Branch and the Technology Development & Technical Services Branch, in co-operation with the United States EPA, Combustion Engineering, and a Canada-United States consultant consortium, completed five weeks of characterization and performance testing at the Mid-Connecticut RDF Incinerator at Hartford. Emission measurement data and samples collected are currently being processed and analyzed for inclusion in a report to be released later this year. This is the third in a series of control technologies studies conducted under Environment Canada's National Incinerator Testing and Evaluation Program (NITEP).

7. At the request of IPB and in co-operation with Ontario MOE and the consulting firm Ortech International, PMD participated in a joint sampling program at the SWARU incinerator to study the pathways of dioxins and other contaminants leaving the incinerator. Simultaneous tests were conducted at the baghouse inlet by PMD and at the outlet by Ortech. Parameters tested by PMD included total particulates, selected heavy metals, mercury, organics (dioxins, furans, PCBs, PAHs, CBs, and CPs), total hydrocarbons, HCl, NO_x, SO2, CO_2, CO and O_2. A data transmittal report was completed and forwarded to IPB.

8. A catalytic reactor for simulating municipal solid waste (MSW)

incineration was designed and constructed. The new quartz reactor contained pellets made with a mixture of Quebec City incinerator ash and castable ceramic. Chloroform was injected into the reactor under various combinations of temperature and residence time conditions. The resulting thermal decomposition profiles and the number of Products of Incomplete Combustions (PICs) were studied. Data from the new reactor were also compared to those obtained from previous tests using other types of reactors. Results from the bench-scale experiment showed that fly ash and ceramic firebricks did not act as catalysts in the formation of PICs and in the destruction of chloroform.

9. Air quality data for the period 1974 to 1988 were loaded into the NAPS M-204 data base of AES. Final programming is underway with assistance from AES, Downsview.

10. Support was given to Environmental Emergencies Technology Division (EETD) to assess the impact of the St.-Basil-le-Grande accident. Two PAH samplers were assembled and calibrated and used to measure ambient air contaminant levels near the site.

11. A detailed report outlining the results of two years of PAH sampling in Toronto and Montreal is in final preparation. The report discusses sampling methodology, emission sources and provides a basis for assessing potential health effects at current exposure levels. An excerpt from this report was prepared for inclusion in the proceedings of the "3rd Conference on Toxic Substances" held in Montreal in April 1988.

12. PAH sampling was initiated at sites in Toronto and Hamilton, Ontario and in Montreal and Arvida, Quebec.

13. New VOC sampling sites were established at eight locations in Ontario, Quebec and British Columbia. Approximately 90 different VOC species are being quantified at each site.

Vehicle Emissions Testing Laboratory (VETL)

The VETL conducts the exhaust emission and fuel economy testing of new motor vehicles offered for sale in Canada in the joint Transport Canada/ Environment Canada audit program to determine compliance with standards and regulations under the Motor Vehicle Safety Act.

The VETL determines emission factors for potential alternative fuels/ blends and for the non-regulated emissions which occur from commercially available fuels (i.e. gasolines and diesel) and from the alternative fuels.

The facility conducts testing programs to update the Canadian fleet emissions which include in-use vehicle monitoring, the effects of maltuning, removal, maladjustment and tampering of emission controls and the effects of our cold climate.

The VETL provides a unique technical advice and assistance program which includes limited testing for industry. The program includes evaluation of fuel-saving devices and the provision of assistance to the general public, governments, industries and institutions.

VETL Highlights

1. VETL has fabricated and implemented a second Sealed Housing for Evaporative Emissions Determination (SHED) for alter-

native fuels testing and characterization of evaporative emissions.

2. VETL participated in a U.S. EPA, (Research Triangle Park) sponsored non-regulated emissions (specifically aldehyde/ketones) analysis correlation program. A series of loaded 2,4-DNPH cartridges and reference standards were analyzed by all participating laboratories. A report is being prepared on the results.

3. VETL has been attending Motor Vehicle Manufacturer's Association (MVMA) meetings as the Canadian government vehicle testing representative and is now accepted as a member of this association. As a result, the VETL is participating in the regular MVMA vehicle testing programs.

5. Two successful vehicle cross-correlation programs were conducted during this period; the Japanese Automobile Manufacturer's Association (JAMA) and a Chrysler/Transport Canada correlation vehicle evaluation program.

6. The particulate dilution tunnel (only unit of this nature in Canada) for vehicle testing has been installed and tested.

7. The 1988 model year compliance audit testing program was completed during this period (total of sixty vehicles). Six vehicles are being retained at the facility pending investigation (or further evaluation by the manufacturer).

8. A development project has been initiated to design a raw exhaust continuous sampling train. This system will be used in the following proposed projects:

   a) methanol vehicle catalyst efficiency evaluation

   b) heavy duty truck and bus on-road emissions

   c) industrial equipment field evaluations.

9. A low blend alcohol program was initiated to evaluate the regulated and non-regulated emissions from vehicles operating on commercially-available blends of methanol (5%) and ethanol (10%).

10. The high-speed steady state project on 1988 model year vehicles (ie. 60, 65, 70, 75 MPH) was completed. A total of 48 vehicles were tested under this program.

11. An oxygen-sensor (vehicle fuel system management component) operation evaluation test project was completed. Two state-of-the-art technology light-duty passenger cars were tested.

12. A vehicle test project to investigate the volatile organic compounds emitted from state-of-the-art technology light-duty cars and trucks was completed. Ninety-two compounds were evaluated for each phase of the urban cycle (3 phases) and for the highway cycle (one phase). A total of sixteen vehicles were tested.

13. The 1987/88 cold weather test program was completed (May 1988). Two reports were prepared on the data from this project. The first concerned the evaluation of the regulated emissions and operating temperatures for the ambient temperature range of -15°C to +15°C (five vehicles were tested). The second report investigated the non-regulated volatile organic compounds in the exhaust of three vehicles over the same ambient temperature range.

14. The 1989 cold weather test project has been initiated and a report will be prepared at the conclusion of

the testing including an evaluation of the VOC sampling undertaken.

15. A series of light/heavy duty diesel and gasoline vehicle pilot test projects were completed to investigate the regulated and non-regulated emissions from these vehicles under both standard and cold weather conditions. Project reports are being prepared on each pilot project.

16. A joint project was inititated with EMR and the Propane Gas Association of Canada to evaluate propane fuel in state-of-the-art vehicle technology.

17. The construction for the VETL extension was initiated with a completion date projected for 15 May, 1989.

18. Transport Canada (Research Development Programs Section) provided funding ($250K) to the VETL for the purpose of purchasing a heavy duty vehicle chassis dynamometer. Additional funding will be provided in 89/90 for the installation of the system. Transport Cananda is proposing urban bus testing for the facility.

CHEMISTRY DIVISION

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ORGANIC ANALYSIS / METHODS
2200 - 67600

Project Manager:
C. Chiu (998-3671)

Objective

Provision of trace and ultra-trace organic analyses on a variety of samples including ambient air and source emission (stack) samples; industrial process feedstocks, ashes, wastewaters and leachates; oils, soils sediments and groundwater; and other matrices of environmental concern. Samples are generally analyzed for a number of constituents such as chlorinated dioxins an furans (PCDD/PCDF), polychlorinated biphenyls (PCB), chlorinated benzenes and phenols (CB, CP), polycyclic aromatic hydrocarbons (PAH) and other aliphatic and aromatic compounds. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analyses.

Relevance

Dioxins and furans are among the most toxic chemicals known and, along with other chlorinated organic compounds such as PCB's, chlorinated benzenes and chlorinated phenols, can pose serious environmental threats. Other organics like PAH's are known carcinogens. Accordingly, there is considerable concern in the general population over the hazards of such substances to health, property and the environment. Such toxic organic substances can be produced from a variety of industrial processes and can also be of environmental concern in waste dump sites or accidental spill situations. Accordingly, there is a need for timely and accurate analysis of such compounds and research on methods of measurement and removal of such substances from the environment.

Work Plan

601 NITEP/USEPA RDF testing: approximately 200-300 analyses for PCDD/PCDF, PAH, PCB, CB, CP, Isomer Specific PCDD/PCDF.

602 B.C. Woodwaste Test Burn, Prince George: Complete analysis of over 110 samples for PCDD/PCDF, PCB, CB, CP - source testing (stack samples), process ashes and feedstocks, ambient air.

603 Complete analysis for PAH & N-PAH on NBS study of oil burn residues in collaboration with EETD.

604 Continue analysis of Windsor-Walpole ambient air samples (re Detroit incinerator background study) for PCDD/PCDF, PCB, CB, CP, PAH.

605 At request of PMD, 180 ambient air PAH sample analyses from 4 Canadian sites as a new long-term NAPS program.

606 A minimum of 20 ambient dioxin analyses are anticipated for the CCME ambient dioxin development program which will be in its second year.

607 At the request of PMD, 15-20 unspecified samples for unspecified organic analysis to support their STDS studies.

608 At the request of PMD, 30 source testing (stack) samples to be analyzed for PCBs as part of PCB source testing method development works.

609 At the request of PMD, 30 PAH samples from bench scale testing of the VOST stack sampling train.

610 At the request of VETL, unspecified organics analysis for 3-4 classes of vehicles under 3-4 different operating conditions. Significant matrix dependent method development likely.

611 Continue ongoing work of Pulp and Paper Dioxin Task Force and analytical Working Group - sample analyses, round robins, etc.

612 Provide emergency organic analysis from spills or other environmental incidents. Maximum excess capacity for all such projects is approximately 50 samples over the year.

613 Respond to other projects that develop throughout the year - typically 10-15 of these are requested. Our capacity to respond to these requests is very limited. No analysis will be carried out for other government departments due to increasing demands from within C&P.

614 Complete analytical protocols for PCDD/PCDF, PCB, PAH, CP, CB from MSW incinerator testing.

615 Continue development of analytical protocols for PCB in Oil and Soil.

616 Complete development of congener-specific PCDD/PCDF analysis for the seventeen, 2,3,7,8 substituted PCDD/PCDF congeners.

617 Develop, modify or refine analytical methods for organic compounds as required.

618 Develop analytical method for VOC analysis of stack VOST samples.

619 Provide technical advice on organic analytical principles, procedures and instrumentation, as required.

Status Report - March 31, 1989

601 Analyses for PCDD/PCDF, PCB, CB, CP and PAH were completed on 18 NITEP-related leachate and ash samples from Swaru and London Victoria hospital. In addition, over 60 train proof samples and two sets of stack samples from the Characterization tests from the Hartford study were also analyzed. The field work for the Hartford tests were delayed until late in the year. Thirty-six samples from the Performance tests were received in late February/March and were immediately submitted for processing and analysis. Process ashes and refuse samples were projected to arrive in April but none has been received due to problems with processing the refuse. QC audit samples submitted by USEPA as a check of our laboratory's performance have been received and analyzed. Audits were conducted both before the actual samples arrived and also during field sample processing.

Our two low resolution MS units were set up for routine homologue, isomer specific and 2378 TCDF confirmation analyses. Our new high resolution MS will be used for isomer specific and confirmation analyses of 38 selected samples from the more than 150 performance test samples that will be analyzed.

602 Results of 91 B.C. woodwaste burn samples analyzed for PCDD/F and CP were reported. A detailed analytical report was completed and will be included in a final report being prepared under contract.

603 R. Lao presented a paper entitled "Identification and Measurement of Polycyclic Aromatic Hydrocarbons and Other Organics in Crude Oil Burning Samples" at the 11th AMOP Technical Seminar in Vancouver, June 7-9.

604 A total of 195 ambient air samples from Windsor and Walpole sites were analyzed and reported.

605 No activity. Project deferred to 89/90 pending establishment of field stations.

606 A report describing our analytical procedures for measuring PCDD/PCDF in ambient air samples was prepared as part of this CCME project. Detailed procedures for both homologue and isomer specific analyses are described. A batch of samples from the interlab comparison study were received in April and are being analyzed as part of a seven lab (5 commercial, 2 government) round robin to standardize the procedures and transfer the technology to the private sector labs.

607 Extracts from samples of Woodbrite 24 - a commercial PCP solution - were prepared in the High Hazard lab and provided to PMD for thermal destruction profile studies on the STDS system.

608 No specific analyses for this project were carried out but analysis of PCBs in stack samples from other projects such as NITEP contributed to the method development work undertaken by PMD.

609 No samples received. Project deferred.

610 In support of VETL's studies of organic emissions in vehicle exhaust, two emission samples collected from gasoline and diesel powered trucks were analyzed for PCDD/PCDF, PCB, CB, CP, PAH and nitro-PAH. These research studies will continue through next fiscal year and plans are to present a paper at the 1989 Dioxin conference in the fall which will describe progress of these analytical studies.

611 • After completion of the first interlab study for the measurement of dioxins in pulp and paper matrices, a second interlab study was conducted and completed within two months. The variation of dioxin results among participating laboratories for studies I and II were compared. The performances of each laboratory with respect to different sample matrices were evaluated.

- C. Chiu presented a paper entitled "Canadian Interlab Study for the Determination of PCDD/PCDF in Pulp and Paper Matrices" at the "Dioxin 88" conference in Sweden, August 21-26.
- Mr. C. Chiu has replaced Bob Lao as Chemistry Division representative on the Dioxin QA Committee (DQAC) chaired by A. Chau of NWRI. Input and final review of the DQAC protocol for the National Pulp & Paper Mill Sampling Program was provided. Specialized technical advice and a document on use of method detection limits was provided.
- M. Bumbaco presented results of the interlab studies to a meeting of the DOE Dioxin Task Force at Burlington.

612 • In response to the PCB warehouse fire incident on August 23 at St. Basil le Grande, Quebec, staff and in-house contractors of the Organic Lab were organized to conduct dioxin and PCB analysis around the clock. As a result, 80 samples, collected from the site, including soil, wipes, ambient air, water and soot were analyzed and the average turnaround time for analyses was within 2-3 days.

- A special three-mill study of B.C. Pulp and Paper plant emissions was undertaken due to problems with fisheries in the area of certain plants. We provided emergency analysis of four effluent samples in order to provide a QC check on the private lab that was contracted to do the work. Samples were analyzed by both Low Res and High Res MS and reported to Pacific & Yukon Region.
- In response to a PCB fire at the Acorn Forest Products mill in B.C., emergency analysis of six soil and swab samples for PCDD/PCDF was completed for Pacific-Yukon region.

613 • Northern Wood Preservers: At the request of Ontario Region, 6 harbour water samples from Thunder Bay are being analyzed for PAH and PCDD/F

- QA for Oil Refinery: At the request of IPB, 3 QA scrubbing water samples from the regeneration facility of Petrocan Oil Refinery in Montreal were received in March for PCDD/F analysis.

- QA for Ambient PAH; QA/QC procedures for ambient air PAH analyses were recommended to Mr. G. Gonthier of Quebec Region. Three sets of QA samples consisting of certified PAH solution, urban dust and ash were prepared and delivered to a contract lab for PAH analysis.

614 An analytical method for the determination of PCDD/F and PCB in feed, process ash and stack emission samples from PCB Waste Incineration was drafted and is being reviewed internally. The final draft of the method is expected to be available by the end of April. These procedures were developed from the protocols that have been developed for MSW incinerators during the NITEP work. Final MSW protocols will be available on completion of the NITEP/USEPA RDF study in FY 89/90.

615 Method development for the cleanup of waste oil by open column chromatography and HPLC for PCB analysis using GC/MSD are being carried out. Methods for soils are also being reviewed to incorporate GC/MSD procedures instead of GC/ECD technology in order to provide isomer specific identification that is necessary for regulatory purposes. The protocol for soils will be very similar to our procedures for ambient air samples.

616 Procedures for isomer-specific analysis (2378-substituted) are being developed on the Hi Res MS. A number of analyses have been reported and work continues on software programs to allow automatic processing, quantitation and reporting of isomer-specific results.

617 • The lab participated in a MOE PAH standard comparison study. Three standards, including the NBS reference standard (SRM # 1647), a Supelco standard (610M) and a MOE standard were measured against our daily PAH calibration standard. Results suggested that there is good agreement between our standard and the three standards submitted for the study.

- To minimize the exposure of personnel to benzene, two experiments were conducted: (1) Extraction of ambient air samples (filter and foams) and urban dust reference material for PAH analysis using cyclohexane and dichloromethane as alternative solvents; (2) Extraction of ambient air samples for PAH/CB/PCB/CP analysis using cyclohexane as an alternative solvent. The experiments were completed and an internal report (CP 890301) entitled *"Extraction of Ambient Air Sample for PAH/CB/PCB/CP Analysis Using Cyclohexane or Dichloromethane as an Alternative Solvent"* was prepared.

- Low CP Recovery: The intermittent problem (low CP recovery with blank sample) still persists despite a great deal of effort. Some variables in the procedures were closely examined but did not show concrete results.

- Sediment: A set of 4 sediment samples provided by NWRI for the Dioxin Interlaboratory QC study is being analyzed for PCDD/F.

618 • K. Li attended the 1988 EPA/APCA Symposium on Measurement of Toxic and Related Air Pollutants in Raleigh, NC, May 1-4. He also

visited EPA Lab and Research Triangle Lab and discussed volatile organic sampling and analysis with U.S. specialists.

- The US EPA protocols (VOST) for the sampling and analysis of volatile organics from source emission were evaluated. Sampling experiments were conducted at Selectone's Paint Plant in Toronto. A total of six pairs of cartridge samples were collected and analyzed for 40 target compounds. A report describing this study in detail was prepared.

619 Hilites reported under project 67750 (751).

SAMPLES ANALYZED by ORGANIC LABORATORY
April 1988 - March 1989

Sample Type	Samples Processed	Numbers of Analyses						Total Analyses
		PAH	PCB	CB	CP	PCDD/F	VOC	
Ambient Air	195	150	97	97	97	32	-	473
Stack Emission	140	57	57	57	131	134	6	442
Leachate/Ash	17	17	17	17	17	17	-	85
Vehicle Emissions	4	4	4	4	4	4	-	20
Fire & Spills	80	-	74	-	-	80	-	154
Pulp & Paper	18	-	-	-	-	18	-	18
Method Development	156	40	40	30	70	10	30	220
Solvent Waste	26	-	26	-	-	26	-	52
Total	636	268	315	205	319	321	36	1464

INORGANIC ANALYSIS / METHODS
2200 - 67650

Project Manager:
J. Dlouhy (613-998-3671)

Objective

Provision of inorganic analyses of samples from the National Air Pollution Surveillance (NAPS) network; from special ambient air and source emission (stack)testing studies; from retail gasoline sampling tests and other programs of environmental significance. Sample matrices include filters, solutions, process feedstocks and ashes, gasolines and other commercial products which are analyzed for a variety of components such as common anions (SO_4, NO_3, F, Cl, PO_4, NO_2), toxic metals (Pb, Hg, As, Se) and simultaneous multiple-element (40) assays of dichotomous filters. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analysis.

Relevance

The NAPS network is used to collect data on ambient air pollution levels in centres across Canada. Special ambient air surveys are also conducted to measure levels of toxic inorganics identified under CEPA. Data on levels of inorganic compounds, such as nitrates and sulphates, can be used to help to delineate the extent of the acid rain problem in Canada and such data can supplement other important studies like the long range transport of air pollutants, which have both regional and international implications.

Work Plan

651 Analyze NAPS Hi-Vols for lead (2760), SO_4/NO_3 (1560) and arsenic (60).

652 Analyze NAPS Dichot filters for SO_4/NO_3 and other common anions (1800), for lead and 39 other toxic metals and elements (1800).

653 Analyze NAPS SSI filters for lead (420) and SO_4/NO_3 (420).

654 For Ontario Region, analyze inhalable particulate filter samples (Dichot) for SO_4/NO_3 (120) and multi-element assay of 40 metals and elements (120) as part of Windsor/Walpole studies.

655 For PMD, 15 stack samples analyzed for Hg as part of Hg from chlor-alkali plant field studies.

656 For PMD, 70 HCl analyses of samples taken at stack sampling projects to compare continuous vs manual HCl methods.

657 Analyze about 400 samples from Cornwall Island Fluoride studies for Ontario region.

658 Analyze gasoline samples submitted by regional offices to determine compliance with leaded gasoline regulations.

659 Provide inorganic analyses for other projects that develop throughout the year.

660 Provide technical advice on inorganic analytical principles, procedures and instrumentation as required.

661 Continue development/refinement of methods for SO_4/NO_3 and other anions and multi-element analyses by EDXRF.

662 Continue participation in inter-lab QA studies with USEPA, Manitoba Environment and Alberta Research Centre.

663 Maintain lab facilities and equipment that are often seriously compromised by power failures and inadequate ventilation and humidity control for critical equipment.

664 Maintain QA charts for tracking performance of production analysis methods.

Status Report - March 31, 1989

Tabular summaries showing the samples analyzed each month in the inorganic laboratory are provided following the sections below which give additional details on the individual work plan projects.

651
- A number of different software programs for the IBM clone for report generation, flow files generation, etc. were written.
- Several BASIC programs (HIVOL, FLOWTIME, RECALIB, EMFABS) for the processing and reporting of different samples were written and tested.
- Some changes were made in the NAPS Hi-Vol filters program.
- Further changes and corrections were done to three BASIC programs for the IBM clone (HIVOLS. BAS, PBNAP 100. BAS, FLOWTIME.BAS).
- Work was interrupted for about three weeks due to problems in the delivery of Methylthymol blue.
- Changes were made in the Hi-Vol NAPS program NAPS3A.BAS to produce an output file with raw data.

652
- Eighteen batches of filters from dichotomous samplers (batches 1 to 7, 45 to 49, 52 and 53, and 63 to 68) were processed and reported via a direct computer-to-computer transfer.
- The spectra from five batches (45 to 49) of dichotomous samplers filters were copied for future processing.
- Assistance was provided to Duane Branch (Kevex) in the repair and maintenance of the spectrometer .
- Extensive processing (deconvolution) of further batches (1 and 4-49) continued.
- The deconvolution programs for all calibrations and all measurement conditions were corrected and partly tested.

653 SSI filters were analyzed on a regular basis.

654 Dichot filters from the Windsor/Walpole studies were analyzed on a regular basis. Over 60 multi-element and anion analyses were carried out and reported.

655 No samples were submitted to the lab. Project cancelled.

656 No samples were submitted to the lab. Project cancelled.

657 Filters from Cornwall Island were analyzed for F- and reported regularly. Over 800 fluoride analyses were provided.

658 Gasoline round robin samples were analyzed for Pb and reported to Alberta Research Council. No gasoline samples were received from Regional office inspections of retail outlets during the year.

659
- Analysis of Cr containing water samples after RO treatment was completed for Environmental Emergencies Technology Division.
- An adaption was made of S. Calmettes (SYC) program for the Siemens X-ray spectrometer for the measurement of samples from different programs and calibration.
- Round robin samples for As,Cd and Pb were analyzed for Cd.
- Calibration solutions for C1-NITEP samples were analyzed and reported.
- Qualitative XRF analysis of a deposit in sampling lines for continuous monitors used at the NITEP Hartford tests was provided to PMD.
- Two Hi-Vol samples were analyzed for SO_4/NO_3 at the request of Dr. Bates, University of British Columbia.
- We have committed to provide multi-element and anion analyses on about 200 dichotomous air filter samples as part of a joint research project with Province of Newfoundland. The purpose of the study is to delineate the extent and nature of ambient air quality problems at Cornerbrook. Data from our analyses will be used to apply source apportionment procedures and to study the influence of long range transport mechanisms.

660 • Assistance was provided to the Vehicle Emission Testing Laboratory in securing the prompt analysis of Mn in gasoline by private contract lab.

• Extensive assistance was provided in management of some aspects of the PCB Warehouse fire in St. Basile-le-Grand.

• Help was provided to Merv Fingas (EETD) with bringing the model 14 ion chromatograph into operation.

• An update and technical comments of the SRM for Pb in stack samples was provided to PMD.

661 • Secondary targets selection measurements and tests were done using Cd,Ba,Ti,Gd,Ge and Mo targets under different conditions. The spectra for two batches of filters from dichotomous samplers (batch 60 and 61) under condition 3 were plotted and evaluated.

• ARISIA to IBM clone RATIO program computer-to-computer transfer and program editting was completed.

• Secondary targets excitation tests were continued to find better excitation conditions. Evaluation of the NBS standards measurements for all three calibrations and all three conditions was completed. Calibration evaluation for NBS standards measurements CONDITION 2 and CALIBRATION 1,2 and 3 was done. Calibration constants and detection limits for Calibration 1 and 2 were generated The new version of the Telix program (V 3.0) was ordered, received, installed and tested. The program is used for the automated transfer of the results to PMD.

• The Dionex ion chromatography system was upgraded to incorporate new gradient elution technology and to speed up operations with an advanced computer system. New analytical columns (AS4A) have also been incorporated to improve resolution and sensitivity.

• A lab study on the stability of SO_4 and NO_3 standards was initiated. In addition, an experiment was undertaken to determine whether dust in the general lab air could contribute to contamination of samples. These checks are part of regular QA tests to ensure utmost quality and accuracy of reported data.

• Detection limits on the Siemens XRF were improved by changing from a 100 to 400 sec. measurement time. This was possible because of the new computer control system that allows unattended automatic processing.

662 Alberta Research Council gasoline round robin samples were analyzed and reported. It was not possible to do the determination of As because the spectrophotometer broke down. Work on the Canadian GeneralStandards Board (CGSB) Petroleum Committee was ongoing.

663 • On June 4 a problem developed on the X-ray tube and/or the X-ray tube power supply. Stability tests were done under different conditions. After a letter to the president of the company and other subsequent actions the Kevex spectrometer was finally repaired.

- The PDP/8E minicomputer, which supported the spectrometer for many years, was, after replacement with an IBM clone, transferred to Crown assets. The X-ray room was cleaned and reorganized after removal of several obsolete software and hardware accessories.
- RO water was tested by Michael Blizzard (Biolab) and a new large capacity carbon bed filter and a new thin film composite reverse osmosis cartridge was installed. He also changed both mechanical prefilters. The quality and quantity of the reverse osmosis water improved dramatically (5uS versus 30uS). In addition, a large capacity reservoir to collect overflow frm the reverse osmosis unit and a new sand filter with automatic backwash were installed. All of these changes have ensured a dependable supply of purified water for our lab needs and we also provide this service to PMD and VETL chemical lab operations.
- All balances in the Division were serviced and found to be in good working order.
- An X-ray diffractometer and graphite furnace AA which are surplus to our needs were offered to other C&P labs through the LMC. No one was interested in this equipment so it was disposed of through Crown Assets.
- Excess chemicals were sent for disposal to reduce the amount of chemicals stored by the Division.

664
- Ion Chromatography results versus the XRF results were plotted and analyzed.
- Spectra from three batches (1 to 3) of archived filters from dichotomous samplers were copied for future processing.
- Changes to the comparison program and the RATIO program for IC and XRF results were completed.
- An update of the XRF method write-up was completed.

SAMPLES ANALYZED BY INORGANIC LABORATORY
April 1, 1988 - March 31, 1989

Statistics	FY to Date	FY Month Average
Total Samples Processed	7549	629
Total Analyses Performed	90298	7525
- EDXRF	70800	5900
- WDXRF	4590	383
- IC	5741	478
- AA	136	11
- TECH	7346	612
- SIE	864	72
- GRAV	815	68

Note: *This table does not include calibration, standards, blanks and replicate results that are carried out, unless they are reported to a customer.*

Legend:

EDXRF = Energy Dispersive X-Ray Fluorescence
WDXRF = Wavelength Dispersive X-Ray Fluorescence
TECH = Technicon Automated Colorimetry
GRAV = Gravimetric
AA = Atomic Absorption
IC = Ion Chromatography
SIE = Specific Ion Electrode

QA/QC ACTIVITIES
2200 - 67700

Project Manager:
B. McDonnell (613-998-3671)

Objective

To design and administer an interlaboratory testing program, by supplying samples, standard reference materials, analytical methods and advice to laboratories of the FPACAQ as well as to commercial and academic laboratories.

To provide advice to other national and international agencies concerning the availability of standard reference materials for use in environmental analysis, and to assist in the development and evaluation of QA protocols for EP administered contracts and methods.

Relevance

In order to improve and document the reliability of environmental measurements, quantitative measures of laboratory performance are required. Interlaboratory studies yield sufficent data to allow statistically valid performance standards to be established for analytical work.

Work Plan

701 Complete an analytical report on As, Cd and Pb in a Noranda smelter dust.

702 Initiate a round robin report on SO_4/NO_3 in solution and filter strips.

703 Complete a round robin and report on PAH in oils.

704 Complete a second round robin on SO_4/NO_3.

705 Provide technical advice and support on analytical principles, procedures and instrumentation related to interlaboratory testing programs, as required.

Status Report - March 31, 1989

701 • A round robin was initiated with a deadline of June 30, 1988. Data had been received from 18 labs to June 30. A mineralogical

report on PD-3 was obtained with the generous assistance of Dr T. Chen of CANMET.

- Work is continuing on the final analytical report. The anticipated completion date is April 30, 1989. Interpretation of data for the PD-3 round robin is complicated by the fact that several labs experienced difficulty with lead analysis (high lead and sulphate content) - i.e. there are more method-related problems with PD-3 than with past samples.

702 • Homogeneity tests on prepared filters indicated unacceptable scatter (in-house method). A round-robin has been initiated for air anions (Br, Cl, NO_2, NO_3, SO_4) and lead in aqueous solution. Concentrations approximate those found in the NAPS network. An in-house LC - vacancy UV method was developed and applied to provide qualitative verification of the samples. Quantitative confirmation was made by gravimetry. A round robin is underway. The deadline for reporting results is June 30, 1989.

703 A literature review is continuing involving evaluation of some HPLC cleanup procedures as well as results of some past interlab surveys for PAH in waste oils. An LC clean-up method is being tested on some simple oils spiked with PAH and two diesel fuels. A GC method and instrumentation have been checked out.

704 Pallflex filter materials have been ordered and received for future round robins.

705 • Comments were provided to Ecole Nationale Superieure de Chimie de Paris for a market survey on a computerized data base for hydrogen in steel.

- ISO/REMCO: A reply was given to document 171 (CRM's of Iron Ores and DRI Available for Chemical Analysis). Other contributions are in progress.
- SRM's: A brief note was provided to the development of a SRM for secondary lead.
- New project: An evaluation of models for assignment of distribution, identification of outliers, and calculation of consensus mean for environmental data. This is a major project in itself - to upgrade if possible existing statistical models and develop the supporting software.
- Mr. McDonnell attended a training course for WHMIS coordinators in Burlington, October 18-19. Chemistry Division personnel have been briefed on the early phases of WHMIS implementation.

MANAGEMENT
2200 - 67750

Project Manager:
M. Bumbaco (613-998-3671)

Objective

Management of the financial and human resources of the Division and development and implementation of policies to ensure safe and productive laboratory operations.

Relevance

Requests for support and advice on complex analytical procedures originate from various C&P RCs as well as other government departments, national and international agencies. Such support is of major significance in our laboratory because of the increasingly high profile and attention being focussed on toxic chemicals in the environment.

Work Plan

751 Review technical proposals for contract analytical work, provide advice on methods and recommend appropriate QA/QC protocols.

752 Plan and direct expenditures necessary to maintain CD lab operations including travel funds, equipment maintenance and repair, service contracts, contracted help, capital purchases and other administrative costs.

753 Attend courses, conferences and technical meetings to keep abreast of the latest developments in environmental analytical chemistry.

754 Continue to implement a Lab Safety Plan for the Division, continue routine analysis of solvent wastes and provide technical assistance in the development of a comprehensive chemical and waste management plan for RRETC.

755 Undertake a program review to clarify the linkages, role and function of the FPACAQ QA/QC program in CD.

756 Continue participation in meetings and programs of the C&P Lab Managers' Committee (LMC).

Status Report - March 31, 1989

751 • Reports on *"Management of PAH and other Organics in Crude Oil Burning Samples"* and *"The Analysis of PAH in Ambient Air Samples from the Petrocan Refinery"* were forwarded to P. Fowlie, WTC.

- Information on Canadian contract labs with a capability for analyzing dioxins and furans was provided to P. Beauchmin, , GVRD, Vancouver.
- Information on our PAH and other organics analyses was provided to L. Green, Energy Systems Associates, Tusten, California.
- Reports relating to the testing of asbestos mining and milling operations were sent to T. Brien, Asbestos Institute, Montreal.
- Reports on Ambient air fluoride monitoring programs conducted at Cornwall Island from 1980-1982 and advice on the use of lime candles was provided to G. Marsden, Ontario Ministry of the Environment, Toronto.
- A tour of our lab and review of PCDD/F procedures was provided for Dr. B. Lange of the Whiteshell Nuclear Research Establishment at Pinawa, Manitoba. They are developing a research program to study appropriate processes that could be used for stabilizing toxic wastes - building on their experience in handling radioactive wastes. To do this they are establishing a Hazardous Organics Analysis Laboratory at their Pinawa facilities. We also provided information on our waste solvent testing program which is unique in Canada.
- Results of PCB analyses of fluorescent light ballasts removed at RRETC were provided to P. Harris, CCB, PVM.
- Input was provided for response to D. S. Malhatra, CFS, who requested assistance in analyzing PCDD/F in 10 tree species in order to assess PCDD/F emissions in forest fires.
- Evaluation reports on GC/MSD and Ion Trap instrumentation were provided to D. Sergeant, DFO, Burlington.
- A research proposal by NWRI entitled *"Dechlorination Reaction of Adsorbed Dioxins in the Aquatic Environment"* was reviewed and comments sent to B. Heskin, P&Y Region, Vancouver.
- A technical review, and comments on acceptance for publication, was provided to Dr. R. Clement, Ontario Ministry of the Environment on a paper entitled *"Recovery Yields of Early Analytical Procedures to Detect 2378 Tetrachloro Dibenzo-p-Dioxin (TCDD) in Soil Samples at Seveso, Italy"*.
- Dr. D. Birkholz of Enviro-Test Laboratories visited our lab to discuss the methodologies for analyses of environmental samples for dioxins. We provided him with technical advice along with our

analytical reports and a PCDD/F standard solution. We also made comments on his report for analysis of PCDD/F in drinking water.

- Dr. R. Voss and his colleagues of the Pulp & Paper Research Institute visited our lab on March 7 to acquire information on dioxin analysis using High Res MS. Our document entitled *"Technical Requirements for HRMS/Data System"* and *"Bid Evaluation for HRMS"* were provided and discussed.
- We declined a request from DND Quality Engineering Test Establishment to analyze PCB in linoleum floor tiles. However, we provided information of PCB analytical procedures and referred them to Canadian commercial labs who could do the analyses. Information was also provided on measuring PCDD/PCDF in solids and in ambient air.
- Copies of our analytical procedures for measuring chlorinated organics and PAH in incinerator emissions was provided to Dr. N. Garprasad with our regional lab in Edmonton.
- Copies of a paper presented at the *'88 Dioxin* conference in Umea, Sweden entitled *"Canadian Interlaboratory Comparison Studies for the Determination of PCDD/PCDF in Pulp & Paper Matrices"*, were sent to the following researchers who requested this information:

  - Dr. H. Fielder, University of Bayreuth
  - Dr. D. Iverson, International Paper Corporate Research Centre
  - Dr. H. Worster, BC Forest Products Ltd.
  - Dr. L. Lafleur, NCASI

- A request from National Transportation Waste Division for analysis of wastes contained in 15 railroad boxcars (23,000 gallons of waste per boxcar) was declined. They were referred to Ontario District Office and CCB for advice, as the boxcars were stored at the train station in Ottawa.
- Information on analytical methods that could be used to measure chlorinated organics from PCB waste destruction facilities was provided to D. Campbell, IPB and H. Dibbs, TD&TSB.
- Information on ambient air fluoride monitoring was provided to B. Nadon, Quebec Region to assist them in developing a monitoring program in the area of Becancouer, Quebec.
- Reports from the early seventies relating to ambient air mercury testing were provided to Dr. L. Azerria, Department of Geology, Laval, Quebec.
- Information on ambient air VOC analysis was provided to Paul Kluckner, P&Y Region labs.
- Methodology for determining PCDD/F in ambient air was requested by Dr. M. Taylor, General Testing Labs, Vancouver.
- A lab tour and information on analysis of air particulates was provided for Dr. M. Diallo, a representative of the Republic of Mali, Africa, who is interested in measuring desertification processes in his country. He expressed interest in sending chemists

for technical training in our laboratories but was referred to the appropriate contacts at External Affairs.

- Details of stack sampling methods for asbestos and the availability of new analytical techniques and commercial testing labs was provided to G. Tiernan of Atlantic region.
- Due to time and equipment constraints we declined on offer from Ontario MOE to participate in a laboratory intercomparison study of PCDD/PCDF in 4L effluent samples.
- We received a request from Dr. G. Perhon, Ottawa Civic Hospital, seeking our assistance in X-ray analysis of lung tissue to confirm the presence of tungsten carbide. Since we are not equipped with the appropriate instrumentation (XRD) we referred him to other possible laboratories in the area.

752
- As in previous years, the Division's A-Base budgets were expended within the first three months of the year. Efforts are continuously underway to secure funds from clients in order to keep the lab running.
- A requisition was submitted and meetings held with Department of Supply & Services to discuss the purchase of a Hi-Resolution Mass Spectrometer for the lab (700K). A total of $573,000 supplementary capital was received for the purchase. The A-Base capital budget for the lab is 73K.
- We completed a reorganization of our Division and changed the name from Analytical Services to Chemistry Division. A new Mass Spectrometry unit has been created in the Organic lab. All PAS for existing and new positions have been updated and submitted for classification review and staffing. Classification of the Chief and Head positions has been completed and staffing is underway. Classification of all other positions is expected to be completed in the new year.

753
- R. Halman attended the Finnigan's Superinco Operation course in Cincinnati, Ohio, June 13-17.
- M. Lanoy attended the Hewlett-Packard's "MS for the Chromatographer" course in Montreal, July 12-14.
- N. Houle attended a half day 'on Chromatography/ Dionex seminar.
- Dr. Dlouhy attended the APCA seminar on "Indoor Air Quality", the Canadian General Standards Board meeting and CEPA seminar at PVM.
- N. Houle attended a one-week course "Computer Systems Fundamentals".
- Dr. Dlouhy attended the 37th Denver X-ray conference and 35th Canadian Spectroscopy conference.
- N. Houle and S. Ritchie attended a two-day course for CEPA inspectors and investigators.

- C. Chiu presented a paper on Canadian inter-lab studies on pulp and paper matrices at the 1988 Dioxin Conference in Umea, Sweden.
- Dr. Dlouhy attended an Hitachi seminar at NH&W organized by SCC.
- Division staff attended WHMIS seminars at RRETC and a first-aid course provided by the Department.
- Dr. Dlouhy attended the MOE Technology Transfer Conference in Toronto and a special seminar on Sharing Options for Ozone Protection sponsored by EC.
- N. Houle attended a Dionex seminar on the environmental applications of Ion Chromatorgraphy.
- Dr. Dlouhy attended several meetings of the CGSB petroleum committee.
- N. Houle completed a one-week PSC course on BASIC computer programming.

754 Routine analysis of all solvent wastes generated in CD labs continues. A first draft of a CD safety manual was prepared. Audio-visual safety-related materials relating to lab safety and chemical handling have been purchased along with material safety data sheets. A one-day health and safety meeting involving all Chemistry Division staff/contractors was held.

755 No activity.

756 Information on CD lab capabilities with respect to CEPA enforcement activities was provided to the LMC chairman. An LMC meeting was attended in December and briefings on the status of our lab operations were presented.

ENVIRONMENTAL EMERGENCIES TECHNOLOGY DIVISION

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SERVICES
4100-67449

Project Manager:
K.M. Meikle

Objective

Provide specialist technical advice and assistance on request; promulgate research and development results effectively; identify departmental and national technology development needs pertaining to spill countermeasures and establish priorities; and plan work and manage resources effectively.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, a geographical area, resource or similar focus of attention.

Work Plan - Task 400

Provide technical advice and assistance as required, including: sending expertise and specialized equipment on-site in emergencies; reviewing the spill countermeasures aspects of draft publications and proposals; serving as a member on the committees for the Environmental Studies Revolving Fund (ESRF) oil spill research and countermeasures studies, the 1989 Oil Spill Conference program, the Response '89 conference program, and the ASTM spill cleanup standards; convening technical working group and management/coordinating committee meetings to establish needs and priorities and to promote cooperative activities with industry and others; developing plans and reporting progress; producing the quarterly Spill Technology Newsletter and 2 technical fact sheets.

Status Report - March 1989

a) Provided advice and assistance for the following incidents:
   - Oil spill at Quebec City;
   - Oil spill at Mirabel;
   - August 23 St. Basile-le-Grand PCB storage facility fire;

- Leaking diesel cache in Baker Lake near Whitehorse;
- A Transport Canada/CCG shipboard PCB problem;
- The post-WW II offshore dumping of mustard gas by DND off the west coast;
- A bitumen spill at Cold Lake, Alta.;
- Oil stranded on Vancouver Is. from the NESTUCCA barge;
- Dimethyl disulphide spill in Halifax;
- 1000 gal diesel spill in BC;
- PCB fire in Vancouver;
- EXXON HOUSTON spill in Hawaii;
- EXXON VALDEZ spill in Alaska.

b) Attended the abstract acceptance meetings for the 1989 Oil Spill Conference and for Response -89, reviewed 23 papers submitted for the Oil Spill Conference and presented papers at both events.

c) Met with US Minerals Management Service staff on 7 occasions to advance the progress of joint activities.

d) Briefed the inaugural workshop of the Colleges, Universities and Schools Safety Council of Ontario (CUSSCO) on EETD's chemical spill response expertise.

e) Briefed visitors from Japan and Sweden on R&D activities of possible mutual interest.

f) H. Whittaker and M. Fingas participated in the ASTM F-20 Committee meetings in San Diego in October and in New Orleans in February.

g) Observed the joint CCG/oil industry skimmer trials in the NRC's outdoor tank in October.

h) M. Fingas gave a requested short course at the C.I.L. plant in Cornwall on the use of the Chlorine EnviroTIPS manual; 6 safety managers attended from C.I.L. plants across Canada.

i) M. Fingas gave a requested lecture on personal protection to about 20 airport safety managers at the Transport Canada training facility in Cornwall.

j) M. Fingas taught 4 WHMIS courses for RRETC personnel and was a lecturer for the training course at WTC for C&P Laboratory WHMIS coordinators.

k) M. Fingas presented a paper at COPE (Conference on Protective Equipment) in Toronto Oct 31-Nov 1.

l) H. Whittaker was an invited speaker on Canadian membrane technology development at the U.S.EPA's National Technology Seminar in Panama City, Fla. in November.

m) M. Fingas attended the jet fuel barge hearings in Vancouver in November in support of PY Region staff.

n) K. Meikle and M. Fingas participated in the U.S.MMS workshop on arctic offshore oil spill response R&D needs Nov 30-Dec 1 in Anchorage, Alaska.

o) H. Whittaker attended a groundwater and soil workshop in Collingwood, Ont. Nov 28 - Dec 1.

p) Advised Transport Canada airport emergencies staff on personal protection equipment for crews responding to accidents involving injury to AIDS victims.

q) K. Meikle gave a briefing on EETD's spill countermeasures equipment, treating agent and field analytical system development projects at the annual EC/EPA meeting at CCIW.

r) Tasks and priorities for FY89/90 work plans were provisionally established following meetings of three technical working groups and consultations with various contacts.

Work Plans - Task 401

Convene the 11th AMOP Technical Seminar complete with published proceedings, initiate preparations for the 12th one, and convene 2 regional seminars on advances in spill response technology.

Status Report - March 31, 1989

a) Convened the 11th AMOP seminar in Vancouver June 7-9 at which there were 127 registered attendees, up 37 from the previous year. Reserved the Marlborough Inn in Calgary for the 12th AMOP seminar and the 6th Technical Seminar on Chemical Spills, the one following the other June 5-9, 1989.

b) Deferred the planned regional seminars and fact sheets until next year and diverted the allocated resources to the St. Basile response and the unplanned work for the U.S. EPA at Oswego, NY.

Work Plans - Task 402

Technically review and print all project report manuscripts.

Status Report - March 31, 1989

a) The manuscripts for 12 EE-series reports, the Proceedings for the 11th AMOP seminar and Vol 13(2) 13(3), 13(4) and 14(1) of the STNL were forwarded for printing.

EFFECTS
4100-67499

Project Manager:
G. Sergy

Objective

Manage the BIOS project and follow-on studies; develop recommendations on the use of biological tests to protect water quality from the consequences of oil and chemical pollution; and determine the effects of cold-climate spills and related countermeasures.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plans - Task 450

Maintain the regional office; provide specialist advice on request; plan and report progress on projects and activities; and serve as a member of national and international committees as required.

Status Report - March 31, 1989

a) All requests for advice and assistance satisfied.

b) Represented TDTSB at the Western Research Planning Committee meeting in Saskatoon.

Work Plans - Task 451

Manage the remaining assets reserved for longterm monitoring of the BIOS test site and produce the report on the 1987 site resurvey.

Status Report - March 31, 1989

a) Secured the balance of Offshore Continental Shelf Environmental Assessment Program (OCSEAP) funding. The funds remaining in the Canadian Petroleum Association (CPA) account were transferred to a regional suspense account.

b) Produced the report on the 1987 fieldwork.

Work Plans - Task 452

Obtain ecotoxicity data on selected potential spill substances.

Status Report - March 31, 1989

a) A contract awarded to G. Harris for toxicity testing. The top 250 spill substances were reviewed for availability of rainbow trout acute lethality data. Tests were completed on highest priority chemicals which were data deficient.

b) Established on-line access to EPA Duluth AQUIRE toxicity data base and assisted EPA in user evaluation of the system.

c) Provided EETD with toxicity data on 1200 chemicals for the re-evaluation of the priority list for spilled substances.

d) Determined acute lethality, and gill damage to salmon and sticklebacks from exposure to NaOH and sulphuric acid at various pH levels.

Work Plans - Task 453

Complete the text of the book on the biological effects of spilled oil in cold marine climates; print the English version; and complete the translation into French (extension of 87/88 contract).

Status Report - Marcy 31, 1989

a) Comments on the revised edited text were received and the decision was made to contract a complete rewrite in a more readable style next FY. The illustrations have been selected.

Work Plans - Task 454

Test spill treating agents in accordance with EP guideline protocols to determine compliance and verify manufacturers' data.

Status Report - March 31, 1989

a) A contract was awarded to G. Harris. He conducted effectiveness and toxicity tests on 13 dispersant components and toxicity tests on 12 foaming agents. Also, 3 products were tested for guideline conformance.

b) Trained two Argentineans for a month on effectiveness and toxicity testing.

Work Plans - Task 455

Develop Environment Canada procedures for aquatic toxicity tests which are used and promoted by EP in the prediction and assessment of threats and the control of toxic substances.

Status Report - March 31, 1989

a) A contract was awarded to D. MacLean and J. Sprague. Workshops of the Intergovernmental Aquatic Toxicity Group in July and November were used to channel advice and resolve procedural issues.

b) Commenced the preparation of six different "Environment Canada Aquatic Biological Methods"- Procedures for rainbow trout, marine stickleback and daphnia were completed.

Work Plans - Task 456

Determine whether there are suitable biological screening tests which could be used to indicate quickly the need to perform a trout test and identify potential problems for spill response and enforcement decisions.

Status Report - March 31, 1989

a) A contract was awarded to EVS Consultants. Correlation was made between aquatic toxicity "legal" test results and rapid "micro-test" results.

Work Plans - Task 457

Advise and serve as the TDTSB focal point for matters related to aquatic toxicity testing and biomonitoring; represent TDTSB on the C&P Biomonitoring Committee; and make a presentation at a workshop on the application of biological approaches under the CEPA.

Status Report - March 31, 1989

a) Organized Industrial Research Assistance Program (IRAP) briefings for DOE regional staff in Edmonton and Regina;

b) Made a presentation to a C&P sponsored workshop at Alliston Ont. on the application of biological approaches under the CEPA.

c) Represented EP at the November meeting of the IWD Biomonitoring Working Group in Burlington.

d) Attended the first meeting of the organizing committee for the production of federal biological QA/QC guidelines.

e) Prepared a five-year implementation plan to address C&P ecotoxicological testing needs and presented it to the LMC at its December meeting.

Work Plans - Task 458

As part of a multi-year continuing effort to provide environmental effects information, criteria and tests in support of STA treating agent guideline development, perform laboratory investigations to: assess lethal and sublethal effects; develop a procedure for use as an indication of persistence; determine acceptability; assess screening-for-use techniques.

Status Report - March 31, 1989

a) A contract was awarded to Beak Consultants. A test was developed to measure toxicity persistence.

Work Plans -Task 459

Assess the adhesiveness, penetration and effects of weathered, waxy or Elastol-treated oil to seabird plumage and the feasibility of alternatives to the use of live birds (eg. bags of feathers).

Status Report - March 31, 1989

a) Deferred because of greater than anticipated time required for Tasks 453, 455 and 457.

Work Plans -Task 460

Develop a plan to address spill-related R&D needs prior to exploratory drilling off the west coast in support of DOE's regional initiative to fill knowledge gaps identified during the public hearing process.

Status Report - March 31, 1989

a) $30,680 was received from the US MMS. A contract was awarded to D.F. Dickins & Associates with completion in FY 89/90.

b) Provided $4K to PYR for a study of the effects of a fuel spill in the Fraser delta.

Work Plans -Task 463

Collect and enter all EETD ecotoxicity testing data into a PC-operated information storage and retrieval system.

Status Report - March 31, 1989

a) A new PC-based data storage system was provided to G. Harris and toxicity test data entered.

SPILL COUNTERMEASURES - ENGINEERING
4100-67539

Project Manager:
H. Whittaker

Objective

To develop, evaluate and demonstrate innovative spill countermeasures equipment and technology under controlled and field conditions.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plans - Task 500

Maintain laboratory facilities and demonstration equipment.

Status Report - March 31, 1989

G. Choryhanna replaced D. Radnoff as contract equipment maintenance and operating technician.

Work Plans - Task 501

Partially share the cost with the US MMS of finalising the offshore boom test protocol that was developed jointly as an OHMSETT (Oil and Hazardous Materials Simulated Environmental Test Tank) Interagency Technical Committee project and tested off Newfoundland in 1987.

Status Report - March 31, 1989

Cancelled. U.S. MMS contracted directly with the OHMSETT operating contractor. Resources were reallocated to new Task 508.

Work Plans - Task 502

Investigate possible intermediate treatment processes for the concentrated effluent from reverse osmosis equipment.

Status Report - March 31, 1989

Initiated in-house but delayed one year by the need to reallocate $2K of the $3K budget to Task 505.

Work Plans - Task 503

Assist in the planning of an experiment to evaluate possible cleanup technologies in conditions peculiar to the west coast. Complements Task 460.

Status Report - March 31, 1989

No requirement this FY for participation by the Engineering Section. Budget of $4K reallocated to Task 505.

Work Plans - Task 504

Complete the feasibility study phase of the work initiated in FY87/8 by an unsolicited proposal and, subject to its being competitive with steam stripping, proceed with the design and construction of a prototype butane stripping unit.

Status Report - March 31, 1989

Feasibility study was completed and small pilot-plant studies were initiated.

Work Plans - Task 505

Complete the construction of a prototype mobile steam stripper as initiated in FY87/8, including functional testing.

Status Report - March 31, 1989

Acceptance testing was completed. The unit was stored in Calgary for demonstration at the June Technology Seminar. Tasks 502, 503, 510 and 541 have been rescheduled to make up the additional $25K FY87/8 funding required because of a FY87/88 contracting delay.

Work Plans - Task 506

Complete the design of a prototype mobile solvent extraction unit as initiated in FY87/8.

Status Report - March 31, 1989

Lab work was completed and report is in preparation.

Work Plans - Task 507

Complete the investigation, design and construction of a prototype mobile pervaporation unit as initiated in FY 87/8 by an unsolicited proposal.

Status Report - March 31, 1989

Construction is on schedule at Zenon Environmental Inc. for delivery in FY 89/90.

Work Plans - Task 508 (New)

Ascertain the feasibility of a Canadian alternative to the non-operational OHMSETT facility under a joint project agreement with the US MMS.

Status Report - March 31, 1989

$18,408 has been received under a joint project agreement with the U.S. MMS and resources have been reallocated from Tasks 400 and 501. A contract has been awarded to D.F. Dickins & Associates with completion scheduled for July 1989.

Work Plans - Task 510

Demonstrate microfiltration/ultrafiltration, reverse osmosis and granular activated carbon technology in the Atlantic Region.

Status Report - March 31, 1989

a) The demonstration of microfiltration/ultrafiltration in the Atlantic region was deferred because of the need to reallocate the resources to Task 505.

b) RO and UF/MF units were deployed to Oshawa at the request of General Motors for an evaluation of the ability to remove oil and glycol from wastewater; it was shown that ultrafiltration reduced the volume of wastewater requiring transportation to a disposal facility by at least 90% and all expenses were reimbursed by GM.

c) The mobile RO unit was deployed with prototype Solarchem UV photolysis equipment to Oswego NY for a 6-week evaluation under a subcontract arrangement with a U.S. EPA contractor at a landfill cleanup. All expenses were reimbursed and contaminant concentrations of 0.8 to 50 ppm in the feed were reduced to less than 10 ppb in the permeate by the combination of RO and UV photolysis.

d) An RO unit was deployed to Sarnia at the request of Dupont for an evaluation of the ability to remove organic and inorganic contaminants from 3 points in a new process; RO was very successful and all expenses were reimbursed by Dupont. EETD staff also suggested and demonstrated a simple technique to alleviate a process fouling problem; if successful on a large scale it could save Dupont at least $100,000 annually.

e) Industrial Programs Branch requested assistance in determining the applicability of membrane technology for treating diesel invert drilling mud residues. The samples provided were impossible to treat by that technique but a procedure based on solvent extraction was shown to be effective at laboratory scale.

Work Plans - Task 511

Refurbish and test the ultrasonic burner as part of a joint project agreement with the US MMS to assess recovery methods for high viscosity oils.

Status Report - March 31, 1989

$54,909 has been received from the U.S. MMS and the contract has been awarded to S.L. Ross. Completion has been delayed until the fall of 1989 by transducer malfunctions.

Work Plans - Task 512

Complete evaluation of the waterjet barrier, including use as a fireproof boom, and demonstrate it in the Atlantic Region.

Status Report - March 31, 1989

a) An evaluation as a fireproof boom at Fleet Technology Ltd's facility in Kanata showed that smoke emission was noticeably reduced. Testing in the St. Lawrence under realistic conditions is planned for June 1989 with CCG assistance.

b) The Atlantic region deployment was deferred to do the work for EPA at Oswego.

Work Plans - Task 514

Test sinking sorbents in a facility comparable to the OHMSETT.

Status Report - March 31, 1989

In abeyance pending the availability of resources.

Work Plans - Task 515

Evaluate electrochemical oxidation for removing organics from groundwater at small pilot-plant scale.

Status Report - March 31, 1989

An unsolicited proposal received from Huron Technologies Inc. is under consideration.

Work Plans - Task 516

Conditional on being able to make the necessary arrangements for cost-sharing with the U. of Tasmania, the US MMS, the Institute of Canadian Forest Industries and the Canadian Forestry Service, assemble a prototype laser ignition device for use from aircraft to control forest fires and ignite oil slicks.

Status Report - March 31, 1989

a) The Canadian Forestry Service is investigating the laser power needed to ignite typical Canadian brush.

b) As a continuation of the joint effort with the U.S. MMS, a contract to be completed in FY89/90 was awarded to Physical Sciences Inc. to investigate the feasibility of a simpler dual mirror pointing and tracking system.

c) The U. of Tasmania has not replied to a request to confirm its intention to bring the dual mode laser to Canada.

Work Plans - Task 517

Complete an in-house joint evaluation with the developer of a metal-catalyzed UV photolysis unit as initiated in FY87/8.

Status Report - March 31, 1989

Completed. T_iO_2 catalyzed UV photolysis destroys chlorinated alkenes and aromatics, alcohols, phenols and aromatics relatively easily but chlorinated alkanes are very resistant.

NON-SPILL COUNTERMEASURES - ENGINEERING
4100-67549

Project Manager:
H. Whittaker

Objectives

To evaluate and demonstrate the applicability of spill countermeasures technology to non-spill cleanups.

Relevance

Supports the departmental and national capability to minimize the adverse effects of environmental contamination. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plans - Task 540

Maintain laboratory facilities and demonstration equipment.

Status Report - March 31, 1989

No resources allocated. Covered by Task 500.

Work Plans - Task 541

Deploy the mobile steam stripper and RO units to Elmira for the joint project with WTC and Canviro that was initiated in FY 87/8.

Status Report - March 31, 1989

Deferred. Resources needed for Task 505.

Work Plans - Task 542

Investigate solvent compatibility of selected pit/dike liner materials. (Deferred from FY 87/8 for lack of resources).

Status Report - March 31, 1989

Deferred another year for lack of resources.

Work Plans - Task 543

Assist WTC on a cost-recovery basis by providing equipment for a small pilot-plant scale evaluation of membrane technology for cleaning wastewater streams from food processing industries.

Status Report - March 31, 1989

In abeyance pending receipt of a firm requirement from WTC.

SPILL COUNTERMEASURES - CHEMISTRY AND PHYSICS
4100-67599

Project Manager:
M.F. Fingas

Objective

To determine the cold-climate properties and behaviour of spilled substances and the effectiveness of spill treating agents.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plans - Task 550

Maintain spill response equipment in readiness for emergency deployment and keep laboratory facilities ready to provide support.

Status Report - March 31, 1989

a) The damage sustained by the towed fluorometer during the 1986 Beaufort Sea dispersant trial has been repaired.

b) All other equipment is ready to go.

Work Plans - Task 551

Attend as an observer at the large Norwegian fate and behaviour offshore experiment originally scheduled for March 1988.

Status Report - March 31, 1989

Participation cancelled when a $10K contribution was required.

Work Plans - Task 552

Share part of the cost of a large scale experimental propane release in Europe.

Status Report - March 31, 1989

Prof. Venart of the U. of New Brunswick, the Canadian coordinator, has been informally notified that $10K will be contributed by EETD but funds this year had to be reallocated to cover higher than expected costs to maintain the laboratory and provide personal protection and field analytical system training.

Work Plans - Task 553

Continue development of portable (Level 2) field analytical methods for organic substances in soil and water.

Status Report - March 31, 1989

A contract was awarded to Counterspil Research Inc. The work was delayed about 2 weeks by the need to deploy M. Goldthorp and the system to St. Basile-le-Grand for a PCB warehouse fire. A report on field analysis was published.

Work Plans - Task 554

Continue work in-house on dispersant formulation improvements and effectiveness test methods.

Status Report - March 31, 1989

Planned work was completed as part of the development of treating agent guidelines under Task 558. A paper describing the current situation was presented at the Anchorage workshop on offshore oil spill response research.

Work Plans - Task 555

Assist EP Atlantic with PERD-funded work to develop a new fluorosensor for oil in water and further the development of a stationary sensor for use on offshore drilling platforms/ships.

Status Report - March 31, 1989

The report on the FY87/8 work and the work statement for FY88/9 have been reviewed and comments have been provided to the project officer. An unsolicited proposal from Barringer was accepted with EC as the

sponsor and partial funding by DFO and Esso Resources and contract negotiations have begun.

Work Plans - Task 556

Continue to expand the library of identifiable substances in the Level 3 mobile field analytical system and demonstrate its capability.

Status Report - March 31, 1989

a) Contract awarded to S.L. Ross Environmental Research Ltd. with D. Vandenberg replacing L. Streutker and the planned work was completed despite having been delayed about 2 weeks by the operational deployment to St. Basile-le-Grand.

b) System demonstrated in Halifax, NS and St. John, NB.

Work Plans - Task 557

Deliver the completed manuscript for the PCB EnviroTIPS manual. (Completion of delayed FY87/8 task).

Status Report - March 31, 1989

No changes were required by the reviewers but a number of important deficiencies were identified during the response to the St. Basile-le-Grand incident and remedial action will delay completion for a year or more depending upon the availability of external funding from the CCEM or other sources.

Work Plans - Task 558

Produce a preliminary draft of guidelines for the use of oil spill treating agents including oil dispersants. (Completion of delayed FY87/88 task).

Status Report - March 31, 1989

A contract to develop effectiveness tests was awarded to R.S. Scientific, Ottawa. Guideline needs have been tabulated, a test for surface washing agents has been developed, and performance data have been obtained for 13 such agents.

Work Plans - Task 559

Arrange for additional U.S. NBS burn-residue sample analysis by the Chemistry Division on request. (Extension of previous joint project with U.S. MMS).

Status Report - March 31, 1989

Deferred to FY89/90.

Work Plans - Task 560

Give one training course on the use of field analytical equipment and the associated personal protection equipment; and continue the scheduled replacement of worn-out personal protection equipment.

Status Report - March 31, 1989

In the continued absence of requirements set by any other departmental or national authority, EETD prescribed its own training requirements for anyone issued with personal protection equipment by EETD. One course on personal protection was given to 12 persons 22-23 November. An introductory course on field analysis was given to 6 persons and the other 6 people received refresher training 24-25 November. A second set of courses was given 14-15 March 1989 in which 13 people received refresher training on personal protection, 2 were trained on the use of field analytical equipment and 7 others received refresher training on that equipment.

Work Plans - Task 561

Deliver the completed manuscript for the basic manual "An Introduction to Hazardous Materials Spills". (Completion of delayed FY87/8 task).

Status Report - March 31, 1989

Unsatisfactory chapters of the first draft of the manuscript must be rewritten. The task was deferred to next year because the allocated PY were consumed by the St. Basile-le-Grand response.

Work Plans - Task 562

Delay production of the first draft of the updated and expanded Manual for Spills of Hazardous Materials to March 1989 at the latest to add another section containing less comprehensive information on at least 5,000 additional substances.

Status Report - March 31, 1989

Data collection was contracted to Consultchem. Completion was delayed another year by the diversion of effort in support of the St. Basile-le-Grand response and the NESTUCCA and EXXON VALDEZ spills.

Work Plans - Task 563

Continue the development of methodology for measuring hydrocarbon solubility in water and cataloguing data for various mixtures and oils.

Status Report - March 31, 1989

Deferred for lack of resources.

Work Plans - Task 564

Prepare a manual of standard methods for laboratory analysis of spilled hazardous materials.

Status Report - March 31, 1989

Completed.

Work Plans - Task 565

Investigate the behaviour of liquids denser than water on sediment at laboratory scale with emphasis on measuring penetration into sediment.

Status Report - March 31, 1989

Deferred for lack of resources.

Work Plans - Task 566

Survey potential in-situ treating agents for contaminated soil and evaluate selected agents in the laboratory. (Deferred FY 87/8 task).

Status Report - March 31, 1989

Continues to be deferred for lack of resources.

Work Plans - Task 567

Continue the joint project initiated in FY87/8 with the US MMS to acquire an understanding of how photo-oxidation affects oil properties and behaviour.

Status Report - March 31, 1989

A contract was awarded to Consultchem with the experimental work being done in-house using the unique RRETC facilities. Important discoveries include the fact that, for reasons as yet unknown, there is considerable variation in the susceptibility of oils to photo-oxidation and that flakes form, detach and sink when heavy oils photo-oxidize. There is also a noticeable increase in the water-soluble component of oils that photo-oxidize.

Work Plans - Task 568

Partially fund and oversee a multi-year study by the U. of Calgary (Prof. R. Rowe) to determine the effect of subsea blowout orifice size on oil droplet size.

Status Report - March 31, 1989

First year results were reported at the AMOP seminar. A second $10K 1-year contract has been awarded and the work is in progress by a graduate student.

Work Plans - Task 569

Compile a catalogue of analytical equipment suitable for spill situations.

Status Report - March 31, 1989

EETD's collection of product brochures has been overhauled and put into a computerized data base. A catalogue of over 170 potentially useful devices has been compiled.

Work Plans - Task 570

Test selected new analytical devices that appear to have potential for field use in spill situations.

Status Report - March 31, 1989

Two devices were tested and both require further development.

Work Plans - Task 571

Review and extend previous work on the behaviour of spilled oil under first-year ice. (Year 1 of a 2-year extension of NOGAP project).

Status Report - March 31, 1989

Deferred pending NOGAP funding.

Work Plans - Task 572

Continue to serve as an invited member of the review committee for the project to update the USCG HACS. (Continuation of a FY87/8 task.)

Status Report - March 31, 1989

No meeting during the reporting period.

Work Plans - Task 573

Improve the modelling capability for soil penetration by spilled substances by partially supporting ongoing work at the U. of Waterloo or by undertaking a review of what has been learned.

Status Report - March 31, 1989

Deferred for lack of resources.

Work Plans - Task 574

Continue to investigate the fate and behaviour of heavy and submerged/overwashed oils at laboratory scale as an extension of the FY87/8 joint project with the US MMS.

Status Report - March 31, 1989

U.S. MMS joint project agreement contracts were awarded to Consultchem and DMER respectively to determine the properties of Californian and other specified heavy oils and further to investigate property changes in submerged/overwashed oils. The Consultchem data have been incorporated into the revised oil properties catalogue and a draft report has been received from DMER.

Work Plans - Task 575

Determine the cause of slick thickness discrepancies between what was indicated by infrared imagery and actual surface observations at the Beaufort Sea dispersant trial. (Joint project with US MMS).

Status Report - March 31, 1989

$49,088 was received from the U.S. MMS and work was deferred a year because of higher priority demands on both project officers.

Work Plans - Task 576

Update the 1981 survey of SCBA (Self-Contained Breathing Apparatus) and totally encapsulated suits.

Status Report - March 31, 1989

A contract was awarded to Counterspil Research and the draft report is being reviewed for accuracy by the manufacturers of the surveyed equipment.

Work Plans - Task 577 (New)

As a joint project with the U.S. MMS, develop a plan for field-scale experiments to verify test-tank and other available data on the effectiveness of in-situ burning for removing spilled oil contained by drifting ice.

Status Report - March 31, 1989

$30,455 has been received from the MMS and work on this multi-year undertaking is progressing on schedule under a contract awarded to D.F. Dickins.

POLLUTION MEASUREMENT DIVISION

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DIRECTION, MANAGEMENT & SUPPORT
2200 - 67200

Project Manager:
D.A. Williams (998-4130)

Objective

Provide direction to and manage program/project activities of the Pollution Measurement Division.

Work Plan

1. Input to Operational Plan for Centre.
2. Develop Work Plans for Division.
3. Prepare regular activity reports.
4. Provide functional direction for all Pollution Measurement Division programs/projects.
5. Manage Pollution Measurement Division resources.

Status Report - March 31, 1989

Reflected in status reports of all PMD projects.

NAPS NETWORK OPERATIONS
2200 - 67201

Project Manager:
P. Brunet (998-4705)

Objective

Co-ordination of the operations of the National Air Pollution Surveillance (NAPS) Network for the measurement of ambient air quality in major urban centres and other areas of concern in Canada. Special ambient air measurement studies are designed and implemented as required.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

(i) Implement recommendations from 2nd Federal/Provincial NAPS meeting.

(ii) Assist provinces in the operation and maintenance of NAPS stations

(iii) Operate three NCA stations

(iv) Procure and distribute 25 replacement analyzers

(v) Verify and distribute 100 cylinders of zero and span gases to provincial agencies

(vi) Train 8 provincial operators on NAPS instrumentation

(vii) Carry out maintenance and repair of 40 monitors at RRETC

(viii) Process 3,000 hi-volume filter samples per year for particulates, lead, SO_4 and NO_3

(ix) Process 1,000 dichotomous filter samples per year for particulates, SO_4, NO_3 and 40 elements.

(x) Operate and update the equipment inventory and site documentation data base systems

(xi) Compile annual performance statistics on 450 air monitors

(xii) Overhaul and calibrate 12 dichotomous samplers

(xiii) Process COH tapes from B.C. and Ottawa-Hull stations. Evaluation of Ottawa/Hull COH tapes has been suspended effective January 1989.

Status Report - March 31, 1989

1. Technical assistance in the operation and maintenance of NAPS stations across Canada was provided to provincial and municipal network agencies in trouble-shooting problems with ambient air analyzers, providing replacement parts, providing consumables and maintenance kits; repairing instruments and calibrating equipment and peripherals.

2. A two-week training program on environmental statistics and various aspects of ambient monitoring was arranged for Mr. A. Al-Hassan of Jordan and provided by Tom Dann and the staff of the Ambient Section.

3. For the NAPS instrument replacement program, a total of 11 new CO (TECO 48) analyzers, 10 ozone (ML 8810) analyzers and 1 multipoint hybrid recorder were provided to the field. In addition, 2 NO_x monitors (TECO 14B), 2 ozone monitors (Bendix) and 4 recorders were refurbished and returned to the field.

4. Compressed gas calibration standards and zero air for carbon monoxide and nitric oxide analyzers and permeation sources for sulphur dioxide were certified and supplied to NAPS provincial and municipal network agencies. A number of gaseous and particulate monitoring instruments were calibrated in the lab.

5. Particulate filters were supplied to a number of NAPS agencies In support of the measurement of total suspended particulates, inhalable particulates, lead, sulphate and nitrate. These filters include those for regular hi-volume particulate samplers, size selective inlet particulate samplers and dichotomous particulate samplers. Exposed filters from December 1987 to June 1988 have been processed and forwarded to the Chemistry Division for chemical analysis. Dichotomous samplers are continuously being overhauled, calibrated and exchanged to ensure proper functioning. Multi-element data for dichotomous filter samples were received from the Chemistry Division.

6. A technical seminar which was organized with the assistance of Alberta Environment was held in Edmonton, Alberta and attended by over thirty NAPS technicians and professionals.

7. COH tapes for B.C., G.V.R.D. and NCR stations were processed.

8. An exemption from the Transportation of Dangerous Goods Act was obtained for the transportation of NAPS span and calibration gas cylinders on road.

NAPS NETWORK DATA PROCESSING
2200-67202

Project Manager:
P. Brunet (998-4705)

Objective

Process and validate NAPS Network data on ambient air quality in major urban centres and other areas of concern in Canada. Disseminate and provide interpretation of NAPS data as required.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

(i) Compile, validate and publish 12 monthly data summaries

(ii) Compile, validate and publish 1 annual summary

(iii) Compile, validate and publish various (10) special data reports (including inhalable particulates, SO_4, heavy metals)

(iv) Complete restructured NAPS data base

(v) Implement changes improving data transmissions procedures.

(vi) Digitize chart records from Whitehorse, Ottawa-Hull station and ozone network in Quebec Region

(vii) Provide selected air pollution data for specific requests.

Status Report - March 31, 1989

1. NAPS network air quality data were collected and processed for publication. Monthly NAPS reports from September 1987 to July 1988 have been validated and sent for publication.

2. Air monitoring data from recorder strip charts, for the Ottawa-Hull station (updated to the end of February 1989) were digitized. Effective January 1989, the data from Hull stations will be collected,

retrieved and updated to the NAPS data base by using the SUMX data-logger and an IBM/PC. The strip charts will be used as a backup for the system.

3. Air quality data for the period 1974 to 1988 was loaded into the NAPS M-204 data base of AES. Final programming is underway with assistance from AES, Downsview.

4. The dichotomous sampler data base was updated to Dec. 31, 1986. Multi-element XRF data were received and incorporated into the data base. Programs were written to allow transfers of the dichotomous sampler elemental data to the NAPS M204 data base.

5. Carbon monoxide exceedances for various 8-hour standards (5, 9, 11, 13 and 17 ppm) were tabulated using the 1986 NAPS data.

6. Annual Reports were requested and mailed to:
   - Mr. Jorgensen, Yokohama Tires, Burnaby, B.C.
   - Ms. Beck, Morrison Hersfield Ltd., North York, Ontario
   - Mr. Waltho, City of Ottawa, Ottawa, Ontario

7. Ozone data tape and station information package was prepared and sent to Dr. A. Lefohn, Montana.

NAPS QUALITY ASSURANCE PROGRAM
2200 - 67203

Project Manager:
P. Brunet (998-4705)

Objective

Review, update and continue implementation of a comprehensive quality assurance program for the National Air Pollution Surveillance Network.

Relevance

Important and far-reaching decisions are based on air quality data. Data may be used to determine attainment of air quality standards, the feasibility of plant expansions or process changes, the necessity of air pollution control device installation, in directing the future growth of industrial areas, and could serve as evidence in courts of law. With current emphasis on legal action and social pressures to abate pollution, it is essential that air quality data accurately represent ambient air conditions.

Work Plan

(i) Implement recommendations from the 2nd Federal/Provincial NAPS Technical Meetings

(ii) Review and update the Quality Assurance Program as required and complete sections of the Quality Assurance Manual.

(iii) Carry out three visits to NAPS agencies to review operations, discuss program changes and provide on-site assistance where required.

(iv) Carry out acceptance tests on 25 NAPS replacement monitors.

(v) Conduct 4 inter-agency tests and provide training to NAPS operating agencies, as required.

(vi) Provide assistance to agencies in quality control activities, especially in the area of instrument calibration (all agencies).

(vii) Carry out 4 field audits of NAPS sampling stations - Quebec, MUC, Ontario and Atlantic Provinces.

(viii) Provide a calibration service for the Quebec rural ozone monitoring program.

(ix) Carry out round robin analyses with NAPS agencies for SO_2, CO and NO.

(x) Carry out a review of network design and air monitoring station siting for two agencies.

Status Report - March 31, 1989

1. In support of the NAPS network, 107 NO span cylinders, 9 CO span cylinders, 8 nitrogen cylinders, 5 NO, 10 CO, 6 SO_2 calibration cylinders and 2 SO_2 permeation tubes were analyzed and supplied to NAPS agencies.

2. The report of the second round robin was distributed at the Edmonton training meeting. The results were discussed in detail during one of the training sessions. The results of this round robin were similar to the first round for CO and NO gases. The results for SO_2 were much improved due to the use of higher concentration test gases. Preparation for the next round of testing is underway for early 1989.

3. Commentary on the QA Manual are being compiled and incorporated into the final version.

4. Operation and maintenance procedures for the new VOC and PAH samplers are under preparation to assist NAPS field operators when these new samplers are installed in the monitoring stations.

5. The ozone reference standards in the calibration laboratory were calibrated with the US National Bureau of Standards (NBS). The results were satisfactory.

6. Acceptance tests on twenty-six replacement analyzers were completed.

7. Seven NAPS stations were audited (Ottawa, Hamilton, Quebec City and Montreal).

8. In support of the NAPS network, 3 ozone monitors, 2 field calibrators, 1 CO monitor and 3 dichotomous samplers were calibrated.

9. Interlaboratory comparison with EPA was done on a hi-vol reference device.

SPECIAL AMBIENT AIR MONITORING SURVEYS
2200 - 67204

Project Manager:
Tom Dann (998-4705)

Objective

Assist C&P Regional Offices and provincial agencies in the identification, characterization and assessment of local and regional air pollution problems.

Relevance

Local jurisdictions do not always have the necessary equipment and expertise to assess rapidly emerging air pollution problems. C&P is regarded as a source of support in such instances.

Work Plan

(i) Provision of advice and equipment for Cornwall Island fluoride monitoring (C&P Ontario).

(ii) Advice and assistance to Detroit Incinerator monitoring (C&P Ontario).

(iii) Assistance re monitoring to document health effects of LRTAP pollutants (H&W Canada).

(iv) Assistance to Manitoba re effects of stubble burning (Manitoba).

(v) Assistance re toxics and LRTAP pollutant measurement and data intrepretation as required (All regions).

Status Report - March 31, 1989

1. The final set of size-selective high-volume filters were processed for TSP, Pb, SO_4 and NO_3, from a National Health & Welfare LRTAP study. This study concluded on March 31, 1988.

2. Filters from the GVRD SO_4/NO_3 epidemiological study were processed. This study will conclude in November 1988.

3. In support of the C&P Ontario Region monitoring program for the Detroit incinerator, two monitoring stations are being operated in the Windsor area. These sites are measuring dioxins, furans, polycyclic aromatic hydrocarbons, PCB, chlorophenols, chlorobenzenes, volatile organic compounds, inhalable particulates and metallic elements. A data report was prepared and forwarded to the Region for official release. A comparison study was conducted on monitoring methodology between Environment Canada and Roy F. Weston Ltd. (under contract to Detroit) by co-locating samplers in Detroit and in Windsor.

4. Meetings of the Detroit Incinerator ad hoc monitoring committee were attended in Detroit.

5. Support was given to Environmental Emergencies Technology Division (EETD) to assess the impact of the St.-Basil-le-Grande accident. Two PAH samplers were assembled and calibrated for the survey.

6. PAH and VOC sampling systems were provided to the Manitoba Department of the Environment to assess impacts of field stubble burning.

7. A total of 16 dry gas meters were calibrated for the PAH sampling program.

8. Assistance was provided to C&P Atlantic Region to carry out a survey of styrene emissions from fibreglass manufacturing. A portable VOC sampler was provided and analyses of collected samples are being carried out.

EVALUATION & DEVELOPMENT of AMBIENT AIR MEASUREMENT TECHNOLOGY
2200 - 67205

Project Manager:
Tom Dann (998-4705)

Objective

Development and evaluation of new ambient air pollution measurement technology to support NAPS network (existing and proposed criteria pollutants) and Toxics and LRTAP Issues. Developed technology will be phased into the NAPS network as required.

Relevance

Because of the ever increasing list of air contaminants of concern, it is vital that effort be expended on development of ambient air measurement methods and on keeping up with developments in the field of air pollution monitoring technology. Efforts to develop and evaluate measurement methods for fine particulates and organic air pollutants have been undertaken in recognition of their priority in the Toxics and LRTAP issues.

Work Plan

(i) Measurement and reporting of Toxic VOC (including benzene and formaldehyde) at 8 sites.

(ii) Begin measurements of PAH at 4 sites.

(iii) Further develop and apply measurement technology for NMOC (oxidant precursors) at sites in Toronto and Vancouver.

(iv) Provide support and direction to CCME sponsored ambient dioxin method development project.

(v) Develop and apply methods for incinerator related toxics (metals, PAH, Dioxin, VOC at three sites in Windsor area (Detroit Incinerator).

(vi) Provide a summary of metal concentrations at Canadian sites and identify major sources.

(vii) Develop and apply methodolgies for characterizing VOC emissions (including benzene and formaldehyde) from vehicle exhaust.

(viii) Further develop and apply measurement techniques for wastewater VOC emissions.

Status Report - March 31, 1989

1. Sampling using solid sorbent cartridge systems (Tenax and Spherocarb) continued at sites in Vancouver and Montreal. Samples are being analyzed for ~70 toxic and oxidant precursor organic compounds.

2. Sampling methods for PCB, chlorobenzenes, chlorophenols, dioxins and furans are performing well at the Windsor sampling site. Very low detection levels are being achieved.

3. A detailed report outlining the results of two years of PAH sampling in Toronto and Montreal is in final preparation. The report discusses sampling methodology, emission sources and provides a basis for assessing potential health effects at current exposure levels. An excerpt from this report was prepared for inclusion in the proceedings of the "3rd Conference on Toxic Substances" held in Montreal in April 1988.

4. A second year work program for the CCME sponsored federal/provincial co-operative R&D project on dioxin sampling and analysis in ambient air was designed and subsequently approved by the CCREM parent committee.

5. An intercomparison study of methodologies for ambient dioxin/furan measurement was carried out in Toronto in December. The study involved the Ontario Ministry of Environment (OME) and Environment Canada and formed part of the CCME sponsored dioxin ambient method development effort. The results from the intercomparison study were presented at the APCA Toxics Symposium, held in Raleigh, N.C. in May 1988.

6. At the request of the FPACAQ Sub-Committee on Air Quality Indices, a report was prepared discussing inhalable particulate coefficient of haze (COH) relationships and their utility in the development of a revised daily index system.

7. Meetings were attended with AES & OME personnel to finalize arrangements for participation in the ADOM model field validation program. PMD will be providing sampling equipment and speciated HC measurements for two sites in Ontario. Sampling was carried out in August and approximately 40 samples were collected and analyzed.

8. Second generation VOC samplers were designed for use with evacuated canisters. Six samplers were constructed and were installed in the field. Existing samplers were upgraded by addition of power fail circuity, new flow controllers and a pre-sample purge

flow path. Further upgrading on the PAH sampler design was carried out.

9. Disussions were held with OME and GVRD staff to finalize details of oxidant precursor sampling programs to be carried out in Toronto and Vancouver during July - October 1988. Sampling systems and canisters were delivered and sampling is underway.

10. A paper on ambient ozone trends in Canada during the years 1979 to 1986 was prepared and delivered at the APCA Annual Conference in Dallas in June 1988.

11. A paper outlining measurement methods for non-methane hydrocarbons and summarizing data collected in Toronto and Vancouver was prepared and delivered at the Quebec Section APCA Conference in Quebec City in May.

12. Final data reports on non-methane hydrocarbon measurements in Toronto and Vancouver were prepared for the Ontario Ministry of Environment and for the GVRD.

13. PMD is participating in an intercomparison study of sampling and analytical methods for aldehydes being co-ordinated by Health & Welfare Canada.

14. A new concentration system was constructed and dedicated to performing speciated hydrocarbon measurement of vehicle exhaust samples. Approximately 250 exhaust samples were processed.

15. Samplers were provided for a survey of organic emissions from two paint factories in Toronto. Analyses were carried out of collected samples and the results were given to the Source Testing Section.

16. An auto-sample injector and computer workstation were purchased for the HP1090 HPLC. The system was set-up and calibrated for automatic injection and data analysis for ambient and automobile exhaust aldehyde samples.

17. A number of meetings were attended and assistance was provided related to the drafting of a technical report by Corporate Planning Group entitled "Nitrogen Oxide Emission Controls in Canada - Present Situation and Future Direction". The report was tabled at the CCME deputies meeting in October 1988.

18. An OECD workshop on oxidant control strategy development was attended in London, England in September.

19. Technical evaluation work was carried out on a Xontech portable VOC sampler, an Environmental S.A. field calibrator, a beta gauge particulate monitor, a Campbell Scientific 21X met station and a data acquisition system (Telog).

20. Presentation on the sampling and analysis of toxic air pollutants were provided to the PACE Hazardous Air Pollutant Seminar and to

the Ontario Ministry of Environment annual meeting of air quality staff.

21. A meeting of the Atlantic Region Oxidants Work Group was attended in Halifax. A presentation on VOC sampling was delivered.

22. An evaluation of a continuous beta gauge inhalable particulate monitor manufactured by MDA Scientific was arranged and carried out in Ottawa during January - March 1989. An initial data report was provided to the FPACAQ sub-committee on air quality indices.

23. PAH sampling was initiated at sites in Toronto and Hamilton, Ontario and in Montreal and Arvida, Quebec.

24. New VOC sampling sites were established at eight locations in Ontario, Quebec and British Columbia. Approximately 90 different VOC species are being quantified at each site.

25. An interlaboratory comparison for ambient air dioxin measurement was arranged as part of the CCME ambient air dioxin project. Field duplicate samples were collected by the OME for distribution to the 5 participating laboratories. A workshop on ambient air dioxins sampling and analysis is being organized for September. The workshop will preceed the Dioxin 89 conference.

26. A paper entitled "Canadian Urban Monitoring Program for O_3, NO_x and VOC" was prepared and delivered at the Vancouver Oxidants Symposium held in February 1989.

SOURCE MEASUREMENT TECHNOLOGY DEVELOPMENT
2600 - 67206

Project Manager:
P.K. Leung (998-4772)

Objective

To develop and/or evaluate Reference Methods in support of CEPA regulations/guidelines. To revise/update existing emission measurement methods. To reflect changes in the art in both equipment and knowledge. To develop new methods in response to emerging priority issues (eg. hazardous wastes). To evaluate commercially available monitors capable of measuring stack emissions on a real-time basis. To actively participate in technology transfer exercises.

Relevance

Reference methods, which are incorporated into national emission regulations/guidelines, specify the emission measurement procedures to be used to determine compliance. Continuous measurement systems provide emission data to control agencies over and above that required for compliance monitoring.

Work Plan

(i) To evaluate the Mercury Reference Method for chlor-alkali plants and amend, if required.

(ii) To develop/amend and publish the following Reference Methods: (a) Particulates - general; (b) HCl- Incineration; (c) CO - general and (d) TRS - pulp and paper.

(iii) To finalize a general sampling method for organics (such as dioxins and PCBs) using the MM5 train

(iv) To develop a measurement method for VOCs using a VOST train.

(v) To prepare for a source measurement workshop in Ottawa (Spring 1989).

Status Report - March 31, 1989

1. **Hydrogen Chloride.** The method was initially published as Technical Assistance Document TS-9. At the request of IPB, the method was updated and will be published as: *"Reference Method for Source Testing: Measurement of Releases of Gaseous Hydrogen Chloride from Stationary Sources"*, PMD 1989. The RM will be incorporated into Environment Canada's Federal Mobile PCB Treatment and Destruction Regulations and CCME's Municipal Waste Operating Guidelines.

2. **Particulates.** Major procedural changes to reflect advance in both knowledge and technologies were made to the Particulate RM. The method will be published as Report EPS 1-AP-74-1, "Reference Method for Source Testing: Measurement of Releases of Particulates from Stationary Sources", PMD 1974 (amended 1989).

3. **Lead.** In co-operation with IPB and Legal Services, the lead emission measurement method was amended and will be published as Report EPS 1-AP-78-3, "Reference Method for Source Testing: Measurement of Releases of Lead in Particulates from Stationary Sources", PMD 1978 (amended 1989). The RM will be part of the CEPA regulations for secondary lead smelters.

4. **Mercury.** At the request of IPB, Report EPS 1-AP-76-1 "Standard Reference Method for Source Testing: Measurement of Emissions of Mercury from Mercury Cell Chlor-Alkali Plants", PMD 1976, is being updated for incorporation into CEPA. Proposed changes to the SRM

and the technical reasons for making such changes were discussed. The dialogue between PMD and IPB resulted in a visit to the CIL plant in Cornwall by representatives from PMD, IPB, C&P Ontario Region and the Ontario Ministry of the Environment. A mercury emission test conducted by the plant was witnessed by the officials. PMD made several recommendations on sampling techniques to the plant personnel on site and documented the observations in a trip report.

5. **Total Reduced Sulphur (TRS).** The proposed Reference Method was developed in co-operation with the Pulp and Paper industry for the continuous monitoring of TRS emissions. The document was reviewed by IPB and will be incorporated into the appropriate CEPA regulations/guidelines for the industry.

6. **Carbon Monoxide (CO).** The proposed Reference Method, originally developed for monitoring CO emissions from oil refineries on a continuous basis, can be applied to various stationary industrial sources The final draft was reviewed by IPB and the RM will be published for incorporation into CEPA regulations/guidelines.

7. **Semi-Volatile Organic Compounds (SVOCs).** In support of the Federal Mobile PCB Treatment and Destruction Regulations, PMD completed the document "Reference Method for Source Testing: Measurement of Releases of Selected SVOCs from Stationary Sources", PMD 1989. The proposed method can be used for measuring emissions of PCBs, dioxins, furans and selected SVOCs from various industrial sources and for determining the Destruction Removal Efficiencies (DREs) of hazardous waste incinerators. Procedures in this RM are based on PMD's hands-on sampling and QA/QC experience at the PEI, Quebec City and Hartford incinerators testing programs (NITEP I, II AND III).

8. **Volatile Organic Compounds (VOCs).** Development work to evaluate a proposed method to measure VOC emissions continues. the Volatile Organics Sampling Train (VOST) purchased last year was field tested at a paint plant in Toronto. No major problems were encountered. Samples collected were forwarded to CD for the development of analytical methodologies. The VOST will be used to measure emissions of benzene and other VOCs from various industrial sources and to determine the Destruction Removal Efficiencies (DREs) of hazardous waste incinerators.

9. **Asbestos.** At the request of the Atlantic Region, PMD reviewed and commented on the Baie Verte compliance testing program. Meetings were held with IPB regarding the updating/amendment of the Asbestos Reference Methods which are part of the CEPA regulations. PMD and IPB also reviewed the request from the Quebec Region to re-evaluate the Reference Methods in anticipation of increased abatement and compliance activities under CEPA.

10. **N_2O.** The N_2O project was initiated by PMD in an effort to develop a method that will measure N_2O emissions from combustion sources.

Initial laboratory tests conducted by PMD indicated that conventional chemiluminescent NO_x analyzers will not respond to N_2O. The possibility of a cost-sharing source measurement program for next fiscal year was discussed with IPB and EM&R.

11. **Gaseous Emissions.** A draft method for the continuous monitoring of gaseous emissions from fossil-fuel combustion sources was completed. Data generated from the method can be used for the evaluation of process and pollution control system performance and for the implementation of enforcement/control actions on a real-time basis. The method, which has been used in many PMD surveys, is developed in anticipation of CEPA regulations that will require such continuous Reference Methods.

12. **Moisture.** At the request of IPB, a continuous method to measure flue gas moisture content was developed in-house and successfully applied during the NITEP III survey at Hartford. The calibration and measurement system associated with the method will be further refined.

13. **Quality Assurance and Quality Control.** PMD provided guidance and recommendations on QA/QC protocols for various source emission measurement methods to IPB, US EPA and several US and Candadian private consultants during the planning stage of the NITEP III program.

14. **Real-time Data Logging.** A state-of-the-art, PC-compatible data logging software package was purchased and integrated into PMD's continuous emission monitoring system. The new system will allow real-time, multi-window display of stack concentrations of total hydrocarbons (THCs), HCl, SO_2, CO_2, CO, O_2, NO_x, and other gaseous substances. The collected data can also be processed, analyzed and graphed while the system continues to monitor in the background. The new technology will enable plant operators and regulatory agencies to have immediate access to analyzed emission information and to implement real-time control action to prevent pollution episodes.

15. **Unsolicited Proposals.** A review was conducted on a consultant's unsolicited proposal for the development of fluoride source sampling and analytical methods. Comments were forwarded to the Industrial Incentives Division.

16. **Workshop.** Plans for a source measurement workshop to be held in Ottawa were delayed because of a schedule conflict with the NITEP III survey.

SOURCE EMISSION EVALUATIONS
2600 - 67207

Project Manager:
P.K. Leung (998-4772)

Objective

To measure emissions from stationary sources either by in-house sampling means or by commercial contractors. To satisfy data requirements for and provide technical expertise to C&P responsibility centres and other clients.

Relevance

C&P is responsible for specifying regulations limiting the emission of hazardous substances and for guidelines limiting other contaminants. Periodically, it becomes necessary to measure emissions to assess their impact and the effectiveness of control measures.

Work Plan

At the request of C&P responsibility centres and other clients, measure and report on emissions of specific contaminants from stationary sources such as (selections to be made during FY):

(i) Paint and pigment plants.

(ii) Hospital Waste Incinerators.

(iii) Hazardous Waste Incinerators.

(iv) PCB Clean-up using Incineration (advise only).

Status Report - March 31, 1989

1. **Paint and Ink Pigment Plants.** A survey proposal to characterize the emissions of aromatics, aldehydes and ketones from two paint and ink plants in the Toronto area was completed and forwarded to IPB. Emission testing at five locations at the paint plant and three at the ink plant were conducted by PMD. Canisters and cartridges were supplied and subsequently analyzed by the Ambient Measurement Section. Source testing reports detailing the emissions of volatile organics from the two plants were completed and distributed.

2. **Hospital Waste Incinerator.** A PMD staff member was invited by the US EPA and the North Eastern States for Co-ordinated Air Use Management (NESCAUM) to present a paper at the Hospital Wastes Workshops at San Francisco and Baltimore. PMD also provided technical advice to IPB in the planning of a Hospital Waste Incinerator Testing Program.

3. **Hazardous Waste Incinerator.** A report containing results of the trial burn tests that were witnessed by PMD at the Occidental Hazardous Waste Incinerator, Buffalo, N.Y. was reviewed. No further request for witnessing or technical advice has been received from the Ontario Region.

4. **Mobile PCB Incinerators.**

   (a) **Goose Bay.** In co-operation with representatives from IPB, TDTSB and the Newfoundland Region, PMD participated in the planning of the Goose Bay project. Technical advice concerning sampling/QA/QC protocols, priorities of process and emission parameters to be tested, cost estimates and other emission measurement expertise were provided. PMD also advised the DND contractor on the recommended methods for testing PCB incinerators.

   b) **Vesta.** As a member of an ad-hoc planning committee, PMD met with TDTSB, Hydro Quebec, Ontario Hydro, Ontario Ministry of the Environment and SNC-Vesta, to discuss a proposed mobile PCB incinerator technology demonstration program. After evaluating the SNC-Vesta testing proposal, PMD/TDTSB negotiated with the companies on a counter-proposal. Discussions are presently underway regarding selection of a test site.

5. **Wood-Fired Boilers.** A proposal by AFE Engineering regarding the performance and emission testing of various wood-fired boilers in P.E.I. was reviewed and comments forwarded to D. Hutchison, Industrial Incentives Division.

AIR POLLUTION CONTROL TECHNOLOGY DEVELOPMENT and ASSESSMENT 2600 - 67208

Project Manager:
P.K. Leung (998-4772)

Objective

Assist in the assessment of air pollution control technology through comprehensive emissions and process monitoring and interpretation of results.

Relevance

C&P is required to identify and assess various control technologies that may be used to prevent or reduce the release of pollutants to the environment. Technical advice on control options is required for the development of regulations and codes of good practice.

Work Plan

(i) Characterize emissions from and evaluate effectiveness of control devices at an RDF Incinerator in Connecticut, USA (NITEP III).

(ii) Characterize organic emissions from a fossil fuel-fired boiler with sorbent addition for SO_2 reduction (FBC thermal power plant in Chatham, N.B.).

(iii) Complete the 1987 Prince George Pulp & Paper survey report (PCP-contaminated waste).

(iv) Characterize and report on organic emissions from a municipal waste incinerator (SWARU).

Status Report - March 31, 1989

1. **NITEP II (Quebec City Incinerator)**

   a) PMD reviewed the QA/QC report submitted by the contractor and forwarded the comments to IPB.

b) PMD has fulfilled all the responsibilities and commitments to the testing program at the Quebec City incinerator.

2. NITEP III (Mid-Connecticut RDF Incinerator)

PMD's involvement with the joint Environment Canada/EPA incinerator testing and evaluation program continues. Thus far, PMD's contributions to NITEP III include:

a) ***Incinerator Plant Selection.*** PMD attended meetings with representatives from the Canadian and US regulatory agencies, visited several potential testing sites in the US, assisted IPB in the preparation of the RFP, and evaluated the contractor proposals.

b) ***Program Contractor Selection.*** PMD attended meetings, reviewed the RFP, evaluated the contractors' proposals and participated in the final selection as a member of the selection panel.

c) ***Overall Program Planning.*** Plans for the NITEP III program (such as scheduling and sampling/QA/QC protocol requirements) were discussed in meetings at Hartford with representatives from US EPA, the State of Connecticut, the Canadian/US consultant consortium and Combustion Engineering. The test site was visited.

d) ***PMD's In-house Planning / Preparation***. In addition to assisting IPB and US EPA in the overall planning of the program, PMD also prepared to provide two emission measurement teams, one to sample the air-preheater inlet for dioxins and semi-volatile organics and the other to monitor gas concentrations of CO, CO_2, O_2, THCs, NO_x, HCl, SO_2, and H_2O, as well as velocity and temperature at the spray dryer inlet. Preparation work included the following:

(i) Five sets of glassware for three organic tests were cleaned and proofed.

(ii) Power requirements, sampling ports and platform drawings, and other site modification requirements were prepared and forwarded to Combustion Engineering.

iii) An in-house QA plan for PMD's continuous monitoring work was prepared and forwarded to US EPA and Entropy (EPA's QA/QC consultant), for comments. The plan was reviewed in a telephone conference with the NITEP External QA/QC team, namely, EPA, Entropy and D. Stevens. Based on the conference call, the external QA/QC team established an overall QA/QC plan for NITEP III.

iv) PMD attended a one-day meeting at RRETC with CD and IPB to discuss various topics on samping and analysis.

v) PMD co-ordinated with the External QA/QC team for a two-day visit to RRETC. The team met with PMD and CD staff at the working level and discussed details of the sampling and

analytical protocols. The team also performed some QA/QC audits on selected PMD testing equipment.

vi) PMD initiated a one-day meeting with IMET to discuss sampling and QA/QC protocols. IMET is one of the three Canadian companies sub-contracted by Alliance, the US-based, NITEP contractor.

vii) Approximately $17,000 worth of calibration gas mixtures were ordered in order to satisfy US EPA's QA/QC requirements for continuous emission monitoring. Selected gases from the manufacturer were verified against NBS cylinders in the RRETC laboratory. A secondary check on SO_2, CO_2, NO and propane concentrations was carried out at the Hartford site using EPA protocol gases.

viii) A total of 69 linearity, zero and span drift, reproducibility and speed of response checks were carried out on the 16 continuous emission analyzers (including back-ups) to be used by PMD at the spray dryer inlet. The results were documented.

ix) The trailer housing the continuous emission analyzers was repaired and upgraded for the trip to Hartford.

x) Auxiliary continuous monitoring devices, such as the analyzer status indicator panel, a heated line transfer box and the H_2O calibration assembly, were designed and fabricated in-house.

xi) A table summarizing the specifications (model, drift, reproducibility and linearity) of PMD's continuous emission analyzers was compiled and forwarded to US EPA and Alliance.

xii) Considerable difficulties were encountered in obtaining customs clearance for PMD's test equipment. With assistance from the Canadian Embassy, the US Dept. of State, and the US Customs Services in Washington, PMD finally obtained an import-duty waiver for the equipment.

xiii) After two postponements on the test starting date, the PMD sampling team left for Hartford on September 10, 1988. The team installed sampling facilities, set up the equipment, performed on-site QA tasks, and completed on-site mobilization in 7 days. However, the plant was reluctant to proceed with the tests while still engaging in legal disputes with the Connecticut Resource Recovery Authority, State of Connecticut and US EPA Region 1. The PMD team returned to Ottawa on September 21, 1988, leaving the sampling equipment and vehicles in Hartford.

e) ***Characterization Tests (CTs) and Performance Tests (PTs).*** After a lengthy legal tug-of-war, several plant operational difficulties and false starts, and some more border-clearance problems, the CTs and

PTs were finally carried out and completed in January and February 1989.

i) The border-clearance problem was again solved by contacting the Canadian Embassy in Washington to request the U.S. Department of State to obtain a temporary duty-free import permit from the U.S. Customs Services.

ii) A total of ten days (January 11 to 24, 1989) of testing was carried out for the CT Series and two weeks (February 13 to March 1, 1989) for the PT Series. PMD worked co-operatively with U.S. EPA and the U.S.-Canadian consulting consortium and provided continuous emission monitoring data at the spray-dryer inlet for the whole survey and organic emission data at the pre-heater inlet during PTs. In addition to sampling, PMD staff also provided technical assistance to the IPB representative on-site as required.

iii) On numerous occasions, PMD met with the U.S. EPA representative and the prime U.S. contractor to resolve and compromise on the differences between Canadian and EPA Reference Methods. Despite these meetings, there were still sufficient difficulties during CTs to warrant extra assistance from PMD. A senior technologist was sent to Hartford to assist the contractor during the first week of PTs.

iv) There were no major testing or QA/QC problems encountered by PMD's continuous and organic emission measurement teams.

v) All data and samples collected by PMD were processed and forwarded to the U.S. prime contractor or to IPB.

vi) PMD reviewed and analyzed emission data generated from the survey as they became available.

vii) PMD continues to work closely with U.S. EPA, IPB and the External QA/QC team on technical matters pertaining to emission measurement and quality assurance.

3. **PCP-Treated Wood Waste Study.** In co-operation with Northwood Pulp and Timber, the Canadian Paper-workers Union, C&P Pacific Region, and the B.C. Ministry of the Environment, PMD participated in a large-scale program to measure the emissions of toxic organics from the combustion of treated and untreated wood waste in a hog-fuel boiler. The survey was conducted in Sept 1987 and processing of PMD's sampling data were completed in Nov 1987. In May 1988, a meeting between PMD, IPB, CD, C&P Pacific Region and the BC Ministry of the Environment was held in Victoria, B.C., to discuss the status of the study. PMD reviewed the Terms of Reference for the hiring of a contractor to write the overall study report and forwarded the comments to MOE. PMD also distributed to the participants an updated version of the proposed format for Volume II of the report. In June 1988, PMD received all the dioxin,

furan and PCP analytical data. The emission measurement report was completed and forwarded to the participating parties for incorporation into the overall study report. The test results from the joint program will be used by the regulatory agencies to set operating criteria for the burning of PCP-treated wood wastes.

4. **SWARU (Solid Waste Reduction Unit) Incinerator.** At the request of IPB and in co-operation with Ontario MOE and the consulting firm Ortech International, PMD participated in a joint sampling program at SWARU to study the pathways of dioxins and other contaminants leaving the incinerator. Simultaneous tests were conducted at the baghouse inlet by PMD and at the outlet by Ortech. Parameters tested by PMD included total particulates, selected heavy metals, mercury, organics (dioxins, furans, PCBs, PAHs, CBs, and CPs), total hydrocarbons, HCl, NO_x, SO2, CO_2, CO and O_2. A data transmittal report was completed and forwarded to IPB.

5. **Chatham Fluidized Bed Combustion Thermal Power Plant.** At the request of IPB, PMD conducted three 4-hour organic runs at the fabric filter outlet of the 20 MW circulating fluidized bed unit at Chatham, New Brunswick. These tests were conducted to characterize the emission of SVOCs from circulating fluidized bed combustion units burning high sulphur coal (with limestone injection). All samples were forwarded to CD for the analysis of dioxins, furans, PAHs, CPs and CBs. An emission testing report was completed and distributed to IPB, NB Power, NS Power and Energy, Mines and Resources. There were no detectable SVOC emissions from the process.

6. **CFB Gagetown Coal-fired Heating Plant.**

   a) During the 1987/88 heating season, PMD participated in an on-going co-operative program with IPB and EMR to evaluate the low NO_x burner and limestone injection (LIMB) technologies at the CFB Gagetown facility. Over a period of 19 days, source emission tests were conducted to study the effects of various plant operating variables (load, Ca/S ratio, primary and tertiary air settings, swirl, injection air and O_2 levels) on boiler emissions (particulates, SO_2, NO_x, total hydrocarbons, CO_2 and CO). Preliminary emission data, along with data on coal and ash analysis, were forwarded to IPB and EMR. The final report is being reviewed.

   b) Two final reports detailing the November 1984 and December 1985 surveys were distributed to IPB and EM&R.

DEVELOPMENT of
HAZARDOUS WASTE INCINERATION TECHNOLOGIES
2600 - 67209

Project Manager:
P.K. Leung (998-4772)

Objective

To continue the evaluation of System for Thermal Destruction Studies (STDS) apparatus at RRETC and generate thermal decomposition profiles for a variety of toxic chemicals.

Relevance

Data on thermal decomposition profiles, products of incomplete combustion and residuals are needed to support incineration as a viable control option. Laboratory studies are the first step in the generation of these supporting data.

Work Plan

1. Complete the report on modifications made to the STDS.
2. Report the study on dioxin formation in the heat recovery system of municipal solid-waste incinerators.
3. Report the correlation study using PCP-contaminated wood waste from the Prince George Pulp & Paper survey.
4. Prepare for and host a STDS workshop in Ottawa.

Status Report - March 31, 1989

1. **Term PhD Position.** Several PhD candidates were interviewed for a proposed term position for the STDS program. Todate, the position remains unfilled.
2. **STDS Operating Manual.** An operating manual for the STDS was completed and reviewed. The manual also contained information on modifications made to the STDS.
3. **Woodbrite 24.** The PCP and TCP destruction profiles for the wood preservative, Woodbrite 24, were generated using the STDS. Results from the bench scale study will be compared to those generated

from the actual combustion testing of PCP-contaminated wood waste at the Northwood Pulp and Timber hogfuel-fired boiler. A brief report will be prepared upon receipt of the analytical results for the field samples.

4. **Simulation Study on the Formations of Toxic Organics in Municipal Solid Waste Incinerators.**

   a) ***Catalytic Reaction.*** A catalytic reactor for simulating MSW incineration was designed and constructed. The new quartz reactor contained pellets made with a mixture of Quebec City incinerator ash and castable ceramic. Chloroform was injected into the reactor under various combinations of temperature and residence time conditions. The resulting thermal decomposition profiles and the number of Products of Incomplete Combustions (PICs) were studied. Data from the new reactor were also compared to those obtained from previous tests using other types of reactors. Results from the bench-scale experiment showed that fly ash and ceramic firebrick did not act as catalysts in the formations of PICs nor in the destruction of chloroform.

   b) ***Chlorination.*** A chlorinating agent (1000 ppm Cl_2) was introduced into a STDS reactor with an aliphatic and aromatic compounds (acetone, N-Heptane, 2,2,4-Trimethylpentane, and benzene). The thermal decomposition products generated were analyzed to determine if the selected compounds were chlorinated to form other organics under simulated incineration conditions. All the compounds were tested at a reactor temperature range of 300°C (baseline) to 800°C, under excess air conditions. The residence time and injection volumes were 2 seconds and 0.5 µl respectively. The study results indicated that there were no chlorinated compounds formed within the specified test parameters.

   c) ***Reaction with Hydrogen in Hydroxyl Group.*** Benzene and water were simultaneously injected into a STDS reactor under excess air conditions and at a reactor temperature range of 300°C (baseline) to 800°C. The residence time and injection volume were kept constant at 2.0 seconds and 0.5 µl respectively. Results showed that water had no observable effect on the thermal destruction profile of benzene under the selected test conditions.

5. **Joint Canada/U.S. Hazardous Wastes Incineration Research Workshop**. The 11th workshop was hosted by PMD and held at the River Road Environmental Technology Centre on February 6-7, 1989. Attending the workshop were technical experts representing Canada/U.S. government agencies, industry and university sectors actively involved in hazardous wastes management and development of disposal technologies. Recommendation and decisions taken will influence the future direction of research activities in this field. To encourage free discussions and flow of information, no formal proceedings were published. As well, a PMD

representative presented a paper at the 10th Workshop in North Carolina. A trip report was completed.

SCIENTIFIC and TECHNICAL ADVICE
2200 - 67210

Project Manager:
D.A. Williams (998-4130)

Objective

To provide advice on the measurement and assessment of air pollution in ambient air and as emitted from stationary sources. To provide technical advice on photochemical oxidant air pollution in Canada. To provide advice on toxic air pollutants in Canada.

Relevance

Dissemination of knowledge necessary for the identification, characterization and assessment of air pollution problems in Canada.

Work Plan

To provide advice on the measurement and assessment of air pollution in ambient air and as emitted from stationary sources. To advise on the performance and development of air pollution control technologies.

Status Report - March 31, 1989

1. Technical advice and guidance on source emission measurement was provided to various federal agencies as follows:

   a) ***C&P Atlantic Region.*** i) PMD commented on a proposal by Super Burn Systems Ltd. of Vancouver to dispose of the Sydney coal tar by incineration; ii) Advice on continuous monitoring of total hydrocarbon emission from a rotary kiln burning oil-contaminated earth was provided; iii) Sampling methodologies for emissions from wood combustion.

   b) ***Quebec Region.*** i) design specifications of in-house SVOC train glassware were forwarded to L. Boisjoly; (ii) copies of PMD's in-house softrware for manipulating and summarizing stack sampling data were forwarded to D. Pilon.

c) ***Ontario Region.*** i) comments regarding the Trial Burn Plan of hazardous wastes in the St. Marys Peerless Cement Plant in Detroit were forwarded to E. Bobet; (ii) the sampling protocols for the Greater Detroit Resource Recovery Project were reviewed and comments forwarded to E. Bobet.

d) ***Pacific Region.*** i) sampling of gaseous hydrogen chloride from incinerators; ii) sampling of hydrogen fluoride.

e) EM&R regarding target compounds for wood combustion emissions and the measurement of Total Hydrocarbon Componds from the combustion of pellets in a wood stove.

f) At the request of UAD, PMD reviewed and commented on the CCME MSW Incinerator Guidelines prepared by Concord Scientific.

g) As requested by Mr. Tony Bambrough of IPB, PMD reviewed and commented on a document on continuous emissions monitoring.

h) Mr. Dave Campbell of IPB regarding PMD's Royal Jubilee Hospital Waste Incinerator report.

2. Technical advice on source emission measurement provided to provincial regulatory agencies, as follows:

a) advice regarding the adaptation of the particulates method for sampling particulates, HCl and mercury was given to Mr. Laroche of MENVIQ.

b) Advice regarding the effects of flow straighteners in a stack was given to D. Lockhart of the B.C. Ministry of the Environment.

c) Mr. Tom Leung of B.C. MOE regarding the accuracy of particulate emissions sampling data.

d) Mr. Gary Wong of Ontario MOE regarding PMD's Royal Jubilee Hospital waste incinerator report.

e) Mr. Kelvin Reeve of Manitoba regarding TRS SRM for stationary sources.

3. Technical advice and guidance on source emission measurement provided to the private sector, as follows:

a) Ontario Hydro regarding continuous source measurement technologies.

b) Mr. Raymond Brunelle of Combustion Engineering regarding test methods for the measurement of emissions from recovery boilers.

c) Authur Gordon Associates regarding continuous data logging system.

d) Mr. Goran Mornhed of ASE Engineering regarding wood-fired boiler emission testing.

e) Mr. Chris Ollerenshaw of London, England (via the Canadian Consulate) regarding the secondary lead smelter regulations and emission testing.

f) Mr. Bob Burley, Northern Telecom Cable Division regarding source sampling methods for the measurement of combustion products from the incineration of PVC-coated cable.

g) MacLaren Plansearch regarding the selection of GF filters for the measurement of secondary lead smelters emissions.

h) Mr. Graham Bethell of Thurber Consultants regarding the combustion of PCP and creosote-treated wood.

i) Mr. John Moisey and Mr. Angus MacDonnell of REPAP regarding the sampling of alcohols from a wood fibre digestion process and the selection of stack sampling equipment.

j) Mr. Hai Teh of Noranda Research regarding the key elements of the sampling and analytical procedures for SVOCs as well as a list of consultants capable of performing SVOC measurement and analysis.

k) Mr. Brent Sadler of Flakt Canada Inc. regarding the merits of out-of-stack filtration versus in-stack filtration.

l) Gordon Robb Assoc. regarding the selection of continuous CO monitors.

m) Mr. Peter Mulroney of Brunswick Fertilizer regarding the measurement of SO_3 from acid plants.

n) Mr. Neil McCall of Pacific Testing regarding flow disturbances.

4. Mr. Brian Williams was invited to present a paper in the 10th joint US/Canada Workshop on hazardous waste incineration held in North Carolina. A trip report was prepared.

5. Mr. P.K. Leung was invited by the US EPA and NESCAUM (Northeast States for Co-ordinated Air Use Management) to present a paper on source emission measurement at the Hospital Waste Workshops in San Francisco and Baltimore.

6. Paul Brunet participated in the B.C. Environment Data Review in Vancouver lead by Paul Kluckner of C&P Pacific and Yukon Region.

7. The NESCAUM Source Protocol Workgroup, of which Mr. P.K. Leung is a member, has published a guidance document for sampling target pollutants emitted from municipal solid waste (MSW) incinerators.

8. DNPH sampling cartridges were prepared and technical assistance was provided to support VETL aldehyde in vehicle exhaust measurement programs.

9. Technical assistance was provided to Wastewater Technology Centre, Burlington for thermal desorption/GC-MSD analyses of volatile organics.

10. Assistance was provided to C&P Ontario Region in drafting a Treasury Board submission related to air toxics monitoring in the Great Lakes Basin. The monitoring is required under Annex 15 to the Great Lakes Water Quality Agreement. A meeting of the Great Lakes Water Quality Annex 15 Work Group was attended in Toronto.

11. Meetings were attended at the request of CMHC to provide technical advice related to the mitigation of methane migration into townhouses located on an abandoned landfill.

12. PMD is providing Branch representation to the Ad-hoc Working Group of the Priority Substances Sub-committee. Weekly meetings were scheduled between July and December 1988.

13. A number of meetings were attended and technical advice was provided to CPG and IPB re the NOx/Ozone Action Plans and the reports to the CCME.

14. Numerous requests for information and advice on selection and application of ambient air monitoring methods for inhalable particulate matter, volatile organics and semi-volatile organics were received and responded to. Information requests came from regional offices, provincial ministries of environment, environmental consultants, industry and universities.

VEHICLE EMISSIONS TESTING LABORATORY

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QUALITY CONTROL ASSURANCE
2200 - 67810

Project Managers:
F. Hendren /J.Rostkowski (998-9590)

Objective

To ensure that the VETL maintains an internationally recognized reputation for accuracy and precision of vehicle test data, and has the capability to complete all project work including R&D, necessitates the undertaking of a wide range of quality control/assurance activities.

These activities include: calibrations, troubleshooting, preventive maintenance, refurbishing and upgrading of the test instrumentation, quality control vehicle testing, reference standard verification for regulated emission analyzers, non-regulated emission analyzers (e.g. GC, HPLC), and sampling trains and international vehicle test and chemical reference standard cross-correlation programs.

The VETL is recognized as a correlation site for exhaust emission testing and chemical and reference standard analysis for vehicle emissions analysis (analysis support from PMD and CD).

Relevance

Environment Canada would have no credibility and thus no influence in motor vehicle matters without accurate test data from the project work undertaken. Decisions based on unverified test results would be meaningless.

Work Plans

1. In-house calibrations, repair and modifications totalling 75 working days per year on the three test cells.

2. Approximately seven vehicle test cross-correlation projects per year of one week each including: MVMA, JAMA, U.S. EPA (3) and the major automotive manufacturers (2). Summary reports are prepared for each program.

3. Three chemical analysis/reference standard cross-correlation programs are conducted per year for non-regulated emissions (e.g. alcohol, aldehyde/ketones) with U.S. EPA and other R&D testing facilities (e.g. manufacturers).

4. Conduct a minimum of 250 emission tests.

5. Complete modifications/renovations and automation of test cell #3 to permit R&D (light/heavy) duty vehicle testing under ambient conditions.

Status Report - March 31, 1989

1. Total in-house quality assurance and cross-correlation testing activity is shown below:

Emission Tests

UDDS	=	85
HWFCT	=	83
505 - HOT	=	121
864 - HOT	=	121
EVAP	=	16
Total	=	***426***

2. (i) Nissan Motor Co. co-ordinated the annual Japanese Automobile Manufacturers Association (JAMA) vehicle and gas correlation program for 1988. The testing was conducted at VETL the week of 23-27 May 1988.

(ii) VETL initiated a dialogue with U.S. EPA to establish a regular vehicle testing cross-correlation program. The result of these discussions was a visit to the VETL by the EPA Quality Assurance staff to evaluate the requirements for joint programs. For purposes of cross-correlation testing, EPA recommended participation in the North American Manufacturers' cross correlation test programs. The VETL participated in the final program of the year and is planning to participate as a member in all future testing projects.

(iii) Transport Canada conducted a verification vehicle testing program between Chrysler and VETL to establish a level of confidence in Transport Canada's new instrumented cross-correlation vehicle (approximate value $100K).

3. (i) A test project was conducted to establish the quality control procedures necessary to have confidence in the sampling technique for the analysis of volatile organic compounds (VOC) in vehicle exhaust. A report has been prepared on the process.

(ii) Test projects were conducted at the request of Transport Canada to establish the quality control procedures for methanol fuelled vehicle testing as per the following:

- establish the stability of methanol instrument reference gases over the life of the gas cylinder;
- evaluation of the effect of mass flow rate on 2,4 - DNPH cartridge breakthrough;
- effect of storage life on loaded (aldehyde/ketones) 2,4 - DNPH sampling cartridges.

(iii) Analysis of gas cylinders was undertaken by VETL for the Transport Canada facility in Blainville. These cylinders are to be used as the reference standards for the testing at that facility. This is an on-going project.

(iv) The US EPA vehicle research section at Research Triangle Park initiated the round robin cross-correlation program for alcohol and aldehyde/ketone analysis. VETL is a participant as a result of the alcohol (specifically methanol) vehicle testing projects that are being conducted at the facility. Regular test projects are being planned for the future.

5. (i) The operation of the diesel particulate tunnel, the upgrade of the tunnel for heavy duty vehicle testing, the heated FID and heated NO_x analyzer for heavy duty vehicle testing were verified using reference standards and industry accepted quality control techniques. Quality control procedures were established and the operation of the system was integrated into the existing test cell automation system.

A diesel vehicle cross-correlation program is being planned for the next fiscal year with GM.

The following sampling systems were fabricated, integrated into the dilution tunnel system and quality control practices established:

a) particulate bound PAH and nitro-PAH;

b) gaseous PAH and nitro-PAH;

c) particulate analysis including trace metals; and

d) aldehyde/ketones.

All of the above systems have been implemented to characterize the exhaust from heavy duty gasoline and diesel vehicles.

(ii) The second evaporative emissions enclosure is completed and calibrated for alternative fuels evaluation. The automation of the evaporative emisssions procedure is being planned for 89/90 for both enclosures.

(iii) VETL automated cell #3 for cold weather testing including the analysis of non-regulated emissions from light/heavy duty vehicles.

6. (i) VETL installed longer roll sections in cell #3 (funded by Transport Canada R&D) to have the capability of testing light/heavy duty vehicles in cold weather conditions.

(ii) Transport Canada provided funds to the VETL to purchase a single axle heavy duty dynamometer having the capacity of testing heavy duty trucks and urban buses with a maximum GVW of 40,000 lbs. and Hpd of 200. Transport Canada's support in implementing this dynamometer has been requested.

The VETL extension which includes the Labour Canada approved fuelling cell and preconditioning cell has been initiated by the construction contractor. Completion of the extension is targeted for 15 May, 1989.

(iii) Plans are being prepared to relocate the existing dynamometers for the purpose of establishing a pre-conditioning cell and a cold weather heavy duty cell. The former is to be operational in August 1989 and the latter in November 1989.

7. (i) VETL has established a contract with Alberta Research Council to provide a complete analysis on fuel samples. The introduction of the sampling and analysis of non-regulated and toxic compounds and the investigation of a wide variety of possible alternative fuels has necessitated the characterization of the fuels specifications. VETL conducts Reid Vapour Pressure (RVP) and distillation tests to verify the quality of the fuels.

(ii) VETL participated in a fuel analysis cross-correlation program managed by the Alberta Research Council. VETL analyzed 10 fuel samples for RVP and distillation curves during the year.

NEW MOTOR VEHICLE COMPLIANCE
2200 - 67820

Project Manager:
F. Hendren (998-9590)

Objective

Light duty gasoline and diesel passenger cars and trucks are tested to determine whether they comply with the applicable Canadian exhaust and evaporative emission standards and fuel economy guidelines. Vehicle models are selected for the program based upon the sales volume, introduction of new models, engine and/or emission control systems.

Vehicles undergoing compliance testing require mileage accumulation to 6000 km. Those vehicles requiring warranty maintenance prior to 6000 km are test driven by VETL on a prescribed urban/highway route complying with the test procedures. The remainder of the vehicles are transported to the Transport Canada facility in Blainville for mileage accumulation.

Vehicles which do not comply with the exhaust, evaporative and or particulate (diesel) emission standards or do not meet the Transport Canada specified fuel consumption guidelines are investigated and corrective action is taken. The VETL provides the test facilities, technical and engineering personnel and advice during the investigations with the manufacturers.

Relevance

It is essential that new motor vehicles comply with the emission standards under the Motor Vehicle Safety Act to prevent an increase in the air pollution burden in Canada.

Work Plan

1. (a) Conduct 350 urban and highway exhaust emission tests on sixty new vehicles.

   (b) Conduct a minimum of 70 evaporative emission (SHED) tests.

   (c) Test drive 10 to 12 vehicles to 6000 km for a total of 72,000 km.

(d) Prepare reports for Transport Canada on each vehicle and on each failure investigation.

2. Investigate 10 to 15 failed vehicles including conducting 100 exhaust emission tests and provide technical/engineering services and facilities as required. Investigations average 3 days each.

Status Report - March 31, 1989

1. (a) **Vehicle Status**

	1987 Model Year	1988 Model Year	1989 Model Year
Received	--	58	30
Released	3	54	12
Testing	--	--	18
Investigation	1	4	2

(b) **Emission Tests**

Urban	300
Highway	80
Evaporative	75
TOTAL	***445***

(c) **Test Mileage Driven**

Approximately 72,000 km

Note: *Transport Canada modified the mileage accumulation requirement for the 1989 model year. Each vehicle will require 3,500 km, a reduction of 2,500 km. If the vehicle does not meet the emission standards on fuel consumption levels, the mileage will be accumulated to 6,000 km and the vehicle retested.*

(d) Compliance Reports Completed

Total = 65

2. **Compliance Investigations**

(a) **Nissan.** Testing resulted in UDDS fuel consumption values which exceeded the Transport Canada guidelines. The manufacturer reviewed the data and requested retesting on different tires. Investigation is ongoing.

(b) **Mercedes-Benz, Porsche** and **VW** representatives were present at the compliance audit testing of their respective vehicles.

(c) **Suzuki** representatives provided a specific shift schedule for the 4 WD Samurai for retesting purposes, as a result of the vehicle not meeting the specified fuel consumption test value limits.

(d) A representative from the **Ford Motor Co**. evaluated a 1988 Taurus and Thunderbird for non-compliance with the federal standards. After retesting, the Taurus was released as it complied with the standards. The Thunderbird was sent to the Ford Testing Laboratories in Dearborn Michigan. The investigation is ongoing.

(e) Transport Canada is planning to send two 1988 **General Motor** vehicles to the GM testing laboratories for further evaluation.

(f) VETL undertook additional coastdown testing on a 1989 Jaguar to investigate high fuel consumption values. Investigation is ongoing.

(g) Transport Canada requested the VETL to conduct three test programs on an Acura Integra and Honda Civic to investigate the possibility of high fuel tank pressures during vehicle operation. Reports are being prepared on the testing.

(h) VETL investigated high particulate mass test values on two light duty vehicles. Further sampling system verification is being conducted prior to confirming the non-compliant results.

NEW FUELS and TECHNOLOGIES
2200 - 67830

Project Manager:
F. Hendren (998-9590)

Project Co-ordinator:
G. Rideout / P. Howes (998-9590)

Objective

Conduct vehicle testing and research and development on a wide range of alternate fuels including alcohol, alcohol blends, compressed natural gas, propane, gasoline blends, diesel and diesel blends.

Design, development and construction of sampling equipment and instruments for testing unregulated pollutants such as unburned alcohol, aldehyde/ketones, VOC's, PAH's, nitro-PAH's, dioxins, PCB and furans.

Development of sampling techniques, quality control procedures an analysis procedures where none exists.

Relevance

It is essential that alternate fuels and alternate power plants be thoroughly evaluated under Canadian operating conditions to ensure that there will be no adverse environmental consequences resulting from their use.

Methods and instrumentation must be developed to undertake a complete characterization of the exhaust and to measure precisely the unregulated pollutants of known health hazards identified in the characterization. The test data from these programs can ultimately affect regulatory decisions relating to fuels and pollutant emission level limits.

Work Plans

1. A total of 150 to 200 exhaust and evaporative emission tests will be conducted on alternative fuels testing including low blend summer grade alcohol fuels of varying Vapour Lock Index (VLI) values.

2. A comparison of the effects on exhaust with the introduction of ethanol and methanol as fuel additives.

3. An evaluation of the effect of an oxidation catalyst/three-way catalyst on the aldehyde/ketone emissions when methanol fuelled vehicles are operated in ambient conditions.

4. An evaluation of the exhaust emissions from light/light-heavy duty vehicles under ambient conditions.

5. An evaluation of the exhaust emissions/performance characteristics and fuel consumption from propane fuelled vehicles in cold weather conditions.

Status Report - March 31, 1989

1. **Emission Tests (Alcohol Projects)**

   Urban = 55
   Evaporative Emissions = 27
   Alcohol analysis = 245
   Aldehyde/ketone analysis = 165

2. (i) The VETL has initiated a pilot test program to evaluate and compare the effects of low blend ethanol (5%, 15%) and low blend methanol 5% on exhaust emissions and fuel consumption with respect to commercial unleaded regular gasoline. The fuels for this project were splash-blended at VETL. A summary report is to be prepared at the conclusion of the testing.

   (ii) An extensive low blend alcohol vehicle program was conducted on three vehicles including a light duty truck to evaluate the exhaust emissions with respect to commercially available gasoline. The low blend alcohol fuels used in the testing were commercially available fuels (i.e. 10% ethanol blended with winter grade unleaded gasoline and 4.5% methanol/4.5% isopropanol blended with winter grade unleaded gasoline. A summary report is being prepared.

   (iii) A pilot test project was initiated to evaluate the exhaust emissions from a vehicle fuelled with low blend alcohol fuels when operated under cold weather conditions. A summary report is being prepared.

   (iv) A project outline was prepared to conduct a pilot study on light/heavy duty vehicles operating on low blend alcohol fuels. The testing is being scheduled for early 89/90.

3. (i) Transport Canada requested the services of the VETL to conduct a vehicle test project for the purpose of evaluating the effects of the oxidation catalyst/three-way catalyst on neat alcohol fuelled vehicle exhaust emissions in ambient conditions. Project has been delayed until 1989/90.

(ii) VETL has designed a field sampling train which will have the capability of sampling raw exhaust and will correlate with the standard CVS sampling technique. The system will sample for regulated emissions, alcohols, aldehyde/ketones, VOC, PAH and nitro-PAH. A prototype has been fabricated to allow the raw exhaust sampling system to be used for field use (i.e. characterization of the exhaust of off-road industrial equipment). Calibration testing is being scheduled for May 1989.

4. VETL has entered into a joint testing program with EMR and PGA (Propane Gas Association) to evaluate propane as an automotive fuel in state-of-the-art vehicle technology. The project consists of evaluating the vehicle performance and exhaust emissions of two light duty trucks operating on propane using five different manufacturer's propane conversion kits. The testing is to be conducted in both standard and cold weather conditions. The project testing has been initiated and will be completed in June 89/90. A detailed test report will be prepared at the conclusion of the testing.

MOTOR VEHICLE SURVEILLANCE
2200 - 67840

Project Manager:
F. Hendren (998-9590)

Project Co-ordinator:
P. Barton (998-9590)

Objective

To conduct testing to evaluate the performance, exhaust emissions, evaporative emissions and fuel consumption of new and in-use motor vehicles under ambient conditions (cold weather), modified vehicle and emission control performance and operating on various commercial fuels. With in-use vehicles, emphasis will be on assessing tampering rates and benefits associated with inspection and maintenance.

Relevance

This work assists in addressing the environmental concerns of Environment Canada and in setting future emission standards to prevent further increases in the total motor vehicle pollution burden.

Work Plans

1. **Cold Weather Testing** - 10 instrumented vehicles and 100 emission tests.

2. **High Speed/Steady State** - 50 new vehicles from the compliance surveillance program; for a total of 450 steady state tests.

3. **Emission Control Hardware Evaluation** - (catalyst efficiency) - selected group of vehicles - 30 emission tests.

4. **Modal Analysis** (real-time sampling) - selected vehicles - 30 emissions tests.

5. **In-Use I/M Screening Program** - selected group of 10-12 vehicles.

6. **Air-Fuel Ratio** - evaluate air-fuel ratio during vehicle testing on the above testing programs as required.

Status Report - March 31, 1989

1. (i) The summary report on the evaluation of volatile organic compounds from the vehicles tested during the 87/88 Cold Weather Test Program was completed.

   (ii) The 88/89 Cold Weather project was initiated in January 1989 with 10 instrumented vehicles. At the conclusion of 89/90, approximately 120 tests had been completed. The testing is still in progress. A summary report will be prepared at the conclusion of the testing.

2. A project was initiated with the 1988 model year vehicle to evaluate the effect of vehicle speed on exhaust emissions. The fleet of 1988 compliance vehicles was to be subjected to a series of nine steady states from 20 to 75 mph. A total of 40 vehicles were tested. A summary report was prepared on the test results.

3. (i) A project was initiated with a selected group of 1988 compliance vehicles (12) to evaluate the level of volatile organic compounds during standard urban and highway cycles, with the vehicles operating on commercially available unleaded regular gasoline. A summary report has been prepared on the test results. A total of 92 compounds were analyzed for during each test.

   (ii) A project was completed on the evaluation of the effects on the exhaust emissions when the catalyst and/or the feedback control system was removed/defeated. Two state-of-the-art technology vehicles (i.e. TWC, O2S) were tested. A project report has been prepared.

6. A pilot project was inititated to evaluate the air-fuel ratio of vehicles on a continuous basis during urban driving cycles. For this testing, a commercially available system was purchased with EMR funding (propane project). Further testing is scheduled for 89/90.

   A project report will be prepared at the conclusion of the testing.

TECHNICAL ADVICE AND ASSISTANCE
2200 - 67850

Project Manager:
F. Hendren (998-9590)

Project Co-ordinators:
G. Rideout/P. Barton/P. Howes

Objective

On a continuing basis, to provide technical advice and assistance to the public, government agencies, other governments and private industry including technical advice, vehicle testing, training, equipment evaluation, loan of equipment and direct technical assistance in the motor vehicle technology and testing field.

To provide testing, evaluation and technical advice on a contract basis to manufacturers of new vehicles (off-shore) and private industry involved in the field of vehicle technology.

Relevance

This service plays an important role in furthering the aims of the Department and is not available elsewhere in Canada.

Work Plans

1. Address 50 requests for technical assistance and information.
2. Complete 20 to 50 emission tests and investigations.
3. Conduct 20 to 40 emission tests and 10-20 evaporative tests on ten vehicles on a cost-recovery basis.

4. Evaluate 5 to 10 fuel saving devices and additives to a total of 20 emission tests.

5. Attend court as expert witnesses in court cases involving misleading advertising.

6. Assist regions in setting up in-use test clinics.

Status Report - March 31, 1989

1. (i) **Magna International**. Provide information and assistance on operating a low level CO exhaust emissions analyzer as a field unit for vehicle testing. Magna contracted to VETL for the use of this instrument.

   (ii) **Blainville Test Laboratory**. VETL completed a preliminary evaluation of the status of Transport Canada's real-time continuous aldehyde analyzer. Transport Canada has requested the VETL to refurbish the analyzer for real-time methanol analysis. The project has been put on hold due to the cost of components.

   (iii) **Manitoba Research Council.** At the request of Syphuer - Mueller, (the contracter designated to evaluate the MRC aldehyde field sampling system), VETL conducted correlation tests and prepared a report on the quality of the MRC aldehyde sampling system.

   (iv) **Syphuer - Mueller**. Under a joint project with Syphuer-Mueller, VETL is providing the cartridge blanks and analysis of the 2,4-DNPH cartridges after heavy duty vehicle sampling. This sampling will carry over into the summer of 89/90.

   (v) **Kingston's Royal Military College.** Requested advice on vehicle hold-down procedures while operating chassis dynamometers.

   (vi) **Diesel Particulate Analysis**. Three companies in various stages of developing instrumentation (gas alarms) for urban bus stations have requested technical information on the type of compounds emitted by diesel engines and the typical levels of emissions.

   (vii) **Poste Canada Post.** Requested technical advice on the efficiency and performance of two devices that are marketed as improving fuel consumption. VETL reviewed the technical reports and prepared responses for the department.

2. (i) **Matheson**. As a public service, the VETL serves as a cross reference point for Matheson Gas Products. Gas bottles are brought to VETL for analysis.

   (ii) **Transport Canada**. Methanol Testing Program. VETL serves as a reference standard for the methanol testing program at the Transport Canada - Blainville facility by "naming" operational

methanol gas cylinders, providing technical advice and assistance on instrumentation problems and testing correlations vehicles.

3. (i) **National Defence**. VETL conducted testing on a DND one-ton vehicle and an ILTIS, (manufactured for use by the Belgian armed forces), for the purpose of comparing evaporative emission levels to the Canadian vehicles tested in 87/88.

   (ii) **Skocar Inc.** contracted to the VETL to conduct compliance emissions testing on a vehicle equipped with a 1989 power train and emission control system and a 1990 prototype vehicle.

   (iii) **EVAC.** VETL has met with the Electric Vehicle Association of Canada to discuss the state of the electric vehicle development in Canada. During the meeting the possibility of joint projects between Environment Canada - VETL and the groups/companies presently developing electric vehicle technology was discussed.

   This proposal is being considered by both groups for the future, possibly 89/90.

4. (i) **Mile Maker (JUBCO)**. VETL evaluated this fuel consumption improvement device for Consumer and Corporate Affairs. Additional testing was performed as part of a joint project with the company and a report was prepared on the device.

   (ii) **Kangaroo Auto Trim.** VETL undertook a joint project with the company to evaluate their fuel consumption improving device. The company requested the services of VETL as it was considering selling the device in Canada. VETL prepared a report on the testing.

   (iii) **FIPS Int'l.** VETL undertook a joint project with the company to evaluate their water injection device for reducing emissions and improving both fuel consumption and power. An initial series of tests were conducted. Further testing is to be conducted on the device in 89/90.

6. (i) **VETL.** Supplied two portable gas exhaust emission analyzers to Atlantic Region for a test clinic during Environment week.

REGULATION and GUIDELINE DEVELOPMENT
2200 - 67860

Project Manager:
F. Hendren (998-9590)

Project Co-ordinator:
Greg Rideout/P. Barton (998-9590)

Objective

Test projects are conducted to suport Environment Canada's evaluation and development of emission regulations and guidelines for light and heavy duty vehicles.

Relevance

It is essential that testing be undertaken to assist in the development of regulations and guidelines to minimize air pollution from motor vehicles in Canada.

Work Plans

1. Conduct a screening program on a limited number of light/heavy duty gasoline and diesel trucks/buses (up to 18,000 lb IW) to evaluate the regulated exhaust emissions and diesel particulate levels.

2. Evaluate regulated exhaust emissions and particulate emissions from both gasoline and diesel light/heavy duty vehicles during cold weather conditions.

3. Conduct a screening project to characterize the non-regulated gaseous and particulate emissions from light duty and light/heavy duty gasoline and diesel fuelled vehicles. The non-regulated emissions to be evaluated include volatile organic, PAH, nitro-PAH, dioxins, furans, PCB, PBB's, etc.

4. Conduct a characterization of the evaporative emissions from vehicles fuelled with commercial gasolines having a range of Reid Vapor pressures.

5. Total of 100 exhaust emission tests and 50 evaporative emission tests for the above projects.

Status Report - March 31, 1989

As a result of the Acceptance of Voluntary Compliance (AVC) with Labour Canada, the VETL has had to significantly reduce the testing in all of the planned testing programs for 88/89.

1. (i) The light duty and heavy duty (secondary tunnel) dilution sampling system has been set-up and integrated into the automation system. Testing projects have been completed to evaluate the correlation of the system.

   (ii) The heavy-duty vehicle transient cycle as recommended by US EPA was implemented on the automation system for proposed programs on heavy-duty vehicle and non-regulated emissions testing.

   (iii) Sampling trains for collection of PAH/nitro-PAH, trace metals and dioxins, PCB's, furans, etc., were set-up and integrated into the heavy duty dilution tunnel. The tunnel was modified in order to undertake a complete characterization of heavy duty vehicle (gasoline/diesel) exhaust. Cycles were implemented into the system to evaluate the emission levels under city, urban and highway driving conditions.

2. The following pilot test projects were undertaken on heavy duty vehicles:

   (i) evaluate the regulated emissions from a light/heavy duty gasoline vehicle (GVWR-10,000 lb.) under loaded conditions in standard temperature conditions;

   (ii) evaluate the regulated and non-regulated emissions from two light/heavy duty diesel vehicles (GVWR of 11,000 and 26,500 lbs.) under standard temperature conditions;

   (iii) evaluate the exhaust emissions, both regulated and non-regulated from two light/heavy duty vehicles (as above) under cold weather conditions.

4. A test project to characterize the hydrocarbon evaporative emissions from vehicles fuelled with both high benzene (4%) and "weathered" summer grade commercial unleaded regular fuels was completed on two 1988 passenger cars.

   A speciation of 92 volatile organic compounds was conducted on the evaporative emission samples. A report was prepared on the testing.

5. A project was conducted in conjunction with the cold weather program to evaluate the VOC emisison levels from state-of-

the-art technology vehicles in cold weather operating conditions.

The project is to be continued into 89/90. A report will be prepared at the conclusion of the testing.

6. VETL conducted two test projects for IPB to investigate the effect on exhaust emissions when MTBE was added to a summer unleaded regular gasoline at a ratio of 11% by volume. Two reports were prepared on the results including the regulated emissions, aldehyde/ketones, alcohols and VOC.

Appendix A - Publications

Manuscript (unedited) Reports

1. *"The Effects of Crude Oil and the Dispersant Corexit 9527 on the Vegetation of a Nova Scotia Saltmarsh: Impacts After Two Growing Seasons"*. EE-103, April 1988.

2. *"A Study of Crude Oil Dispersion: the Role of Mixing and Weathering"*. EE-104, May 1988.

3. *"Mesoscale Application and Testing of an Oil Spill Demulsifying Agent and Elastol"*. EE-105, May 1988.

4. Proceedings of the 11th AMOP Technical Seminar, June 7-9, 1988.

5. *"Environmental Sensitivities of Chemical Spills in the North Thompson River: Development of a Water Quality Model and a Scenario Analysis"*. EE-106, September 1988.

6. *"Long Term Fate and Persistence of Stranded Oil from the BIOS Project, NWT Canada and from the Metula Spill, Tierra del Fuego, Chile: 1987 Results"*. EE-107, December 1988.

7. *"Remote Sensing Chronic Oil Discharges"*. EE-108, December 1988.

8. *"Modelling of Oil Spills in Snow"*. EE-109, December 1988.

9. *"A Person Portable Analytical Kit (PPAK) for the Analysis of Organic and Inorganic Compounds in Water and Soil"*. EE-110, January 1989.

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Appendix B - Employees

Employees . . .

Director's Office

BRUER, Lyle	Stores
HEINRICH, Guenter	MaintenanceTechnician
HOWES, Trish	Secretary
LACHANCE, Edgar	Computer Anayst
LAO, Robert	Senior Scientist
THORONTON, Dave	Director
ZONGORA, Veronica	Administrative Officer

Chemistry Division

BUMBACO, Mike	Chief
CHIU, Chung	Head, Organic Lab
DLOUHY, Joe	Head, Inorganic Lab
HALMAN, Ron	Technician, Organic Lab
HOULE, Nicole	Technican, Inorganic Lab
LANOY, Monique	Technician, Organic Lab
LI, Ken	Chemist, Organic Lab
McDONNELL, Brian	Co-Ordinator, Quality Assurance
RITCHIE, Scott	Technician, Inorganic Lab
THOMAS, Bob	Technician, Organic Lab

Environmental Emegencies Technology Division

BOBRA, Alice	Project Scientist
FINGAS, Merv	Head, Physics/Chemistry
GRIBBON, Debi	Secretary
KELLER, Lisa	Project Engineer
MEIKLE, Ken	Chief
PUNT, Monique	Project Engineer
ROY, Dave	Technician
WHITTAKER, Harry	Head, Engineering

Employees . . . (*continued*)

Pollution Measurement Division

BRADT, Paul	Technologist, Operations & Maintenance
BRUNET, Paul	Head, Ambient Measurement
CIANCIARELLI, Dominic	A/Supervisor, SourceTesting
D'ADDARIO, Frank	Technologist, QA & CSM
DANN, Tom	Head, Air Toxics
FEWSTER, Jan	Secretary
GILBERT, Clem	Technologist, Operations & Maintenance
HODGSON, Ross	Project Engineer, Measurement Technology
LEUNG, P.K.	A/Head, Source Measurement
LIMOGES, Ray	Technologist, QA & CSM
MAR, Jim	Supervisor, Measurement Technology
MEADOWS, Al	Technologist, Source Testing
RIGDEN, Ian	Technologist, Source Testing
SHELTON, John	Supervisor, NAPS Data Publications
STEENKAMER, Adrian	Chemist, Measurement Technology
WANG, Daniel	Project Scientist, Air Toxics
WILLIAMS, Brian	Supervisor, QA & CSM
WILIAMS, Don	Chief
YEATMAN, Rick	Technologist, NAPS Data Publications

Vehicle Emissions Testing Laboratory

BARTON, Peter	Project Engineer
BREALEY, George	Calibration Technician
CORKE, Doug	Test Technician
EDWARDS, Elisabeth	Secretary
HENDREN, Fred	A/Chief
HOWES, Peter	Project Technician
McASKILL, Clayton	Test Technician
McASKILL, Ron	Head, Vehicle Section
MOODIE, Ron	Test Technician
POIRIER, Gaetan	Vehicle Maintenance Technician
PRYCE, Kes	Vehicle Processing Technician
ROSTKOWSKI, Jacek	Head, Testing/Quality Control Section
SOULIGNY, Michel	Electronic Calibration Technologist
THOMPSON, Charlie	Test Technician